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PUNJAB
SANATORY REPORT.
1862.

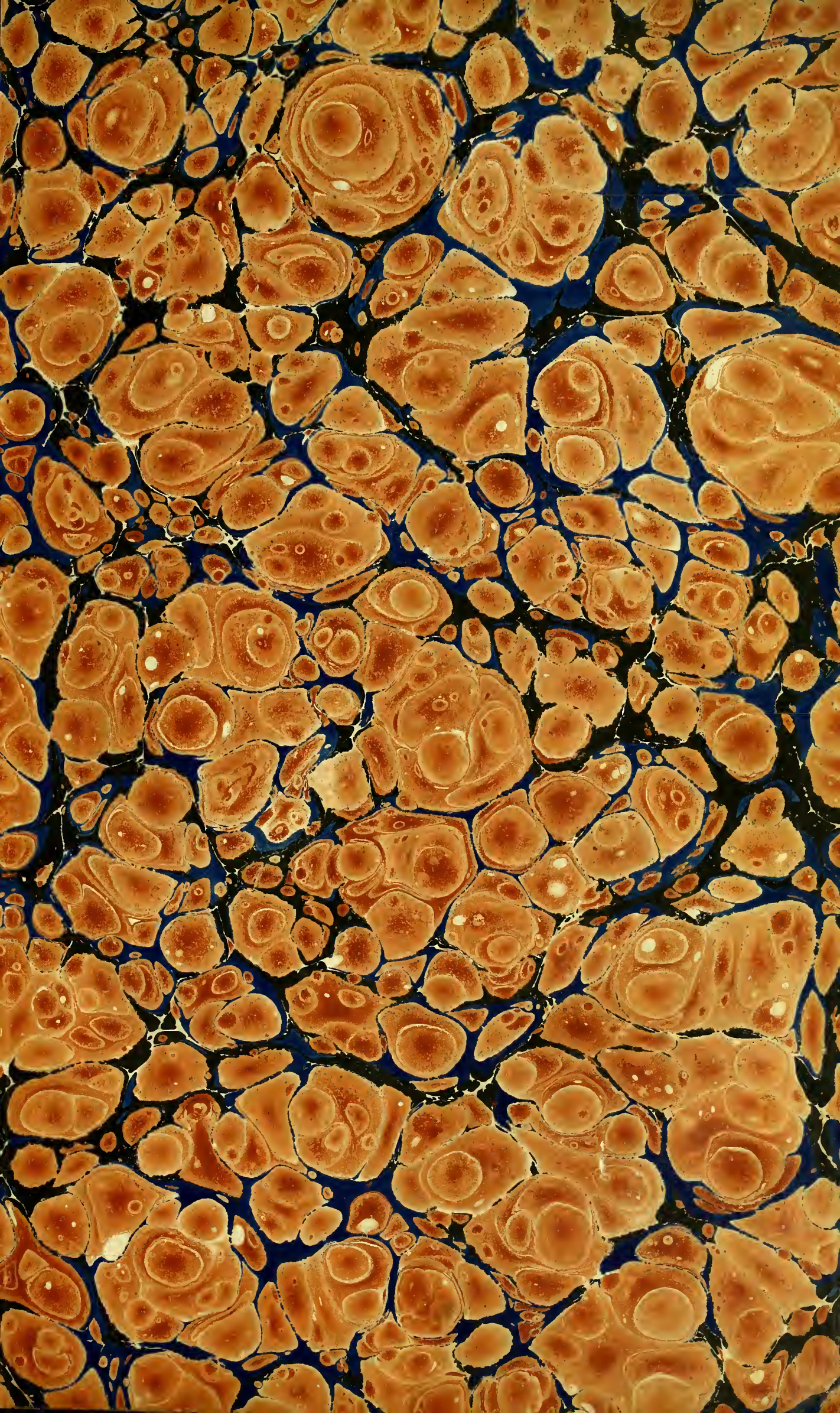
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*John Venn Esq
from C. Hathaway. Lahore. India*

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SANATORY REPORT.
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PUNJAB SANATORY REPORT.

FROM

C. HATHAWAY, ESQR., M. D.,

Inspector General of Prisons, (Punjab)

SPECIAL SANATORY COMMISSIONER,

TO

R. H. DAVIES, ESQR.,

Secretary to the Punjab Government.

LAHORE, 14th May 1862.

SIR,

In accordance with the instructions contained in your letter, No. 1576, of the 11th of October 1861, intimating that, under the authority of the Government of India, I was appointed Special Sanatory Commissioner, to inspect and report upon the conservancy arrangements in the principal Military Stations in the Punjab, I have the honor to submit the result of my observations and enquiries, for the information of His Honor the Lieutenant Governor.

2.—Following the plan which I have adopted, for many years, in my periodical reports on the jails in this Province, it will be useful to make a few preliminary remarks on the main points to which the extent of my investigation appears to be limited, as, thereby, much useless repetition will be saved when speaking of each station separately.

3.—As my report is desired to be based on personal inspection, I have omitted all theoretical discussion as to the cause of disease, and have confined myself to the practical consideration of the subject of conservancy; first pointing out what are the great rules which Nature and experience have laid down for our guidance, and then showing how and where these rules are disregarded, with the remedial measures that suggest themselves for the abolition of existing evils.

4.—Having been engaged in applying these principles for the last ten years, and the result being pronounced by the Punjab Government as eminently successful, I must be excused if I illustrate some of my remarks by what has been effected in the jails of this Province; my object being to show that the sanatory measures I advocate are founded not on theory but on personal experience, and that the same laws apply equally to any body of men, whatever may be their class or condition.

5.—At the same time, I have not hesitated to quote the opinions of those who have been
Opinions quoted. labouring in the same path with myself, or to adduce evidence
 furnished by my professional brethren in their Military Reports,
 where the same results have been gained in the Regiments they have charge of.

6.—The intimate connection between dirt and disease, which is proved by the most un-
Connection between dirt and disease. mistakable evidence to exist in all countries and climates, is perhaps
 still more apparent in India, where, under the continuous powerful
 influence of a tropical sun, with a long and protracted rainy season, followed by a very brief
 and mild period of cold weather that is not severe enough to receive the name of winter, the
 results of neglecting the Hygienic laws of nature, are daily witnessed in the numerous forms of
 disease which run their course with the most rapid and fatal effect.

7.—The three essentials to life are air, food, and water, and, as a universal rule, accord-
The essentials of life and health. ing to their purity or impurity, so will either health or disease exist.

8.—In no quarter of the globe, probably, is the essential value of pure air so patent as
Air. in this country, whether we consider the morbid influences resulting
 from malaria, the deadly exhalations from stagnant water and de-
 composing animal or vegetable refuse matter, or the poisoned state of an atmosphere that has
 been contaminated by the products of expiration from the human body.

9.—If air were more constantly considered as a fluid, capable of being fouled and dirtied
Considered as a fluid. in the same way as water is, we should be more inclined to pay atten-
 tion to the natural sense of smell, which, like all our senses, has been
 wisely given us, not merely for our gratification and enjoyment, but as a valuable guide by
 which we are capable of detecting danger and avoiding it.

10.—Has any one ever entered a barrack (in the middle of the night) in which fifty or a
State of the atmosphere in a barrack during night. hundred soldiers were sleeping, without being sickened by the close
 and unwholesome effluvia that pervades the whole building? And
 yet there is no reason that it should be so; there is no reason why the atmosphere during the
 night should be permitted to become more loaded and offensive than in the day. But, certain
 it is that free ventilation is most unmistakably called for; not mere cubic or superficial space,
 but a greater ingress of fresh air, and a more rapid egress of that which has become impure and
 unwholesome.

11.—And this is, I think, one main reason why the European Officer enjoys a greater
One cause of disease among troops in India. degree of health than the Private, and rallies sooner when attacked
 with sickness; for if pure air be necessary to health when well, it be-
 comes doubly so in a state of disease, when the secretions from the skin, and exhalations from
 the lungs, become not only injurious but highly poisonous.

12.—We know that in the Crimea, the mortality in the great hospital at Scutari was as
Illustrated also in the Crimea. much as 40 per cent., while in tents at the same time, with fewer
 comforts and advantages to the sick, it was less than half that rate.

13.—It is a remarkable fact that, at more than one station in the Punjab where cholera

Cholera appearing first in the Hospitals. appeared last year, the first case occurred in the hospital, and this alone would show the absolute necessity not only of removing the excreta at once, but of abolishing as much as possible the use of close-stools, and especially the custom of keeping them in the verandahs and corner rooms.

14.—A valuable little instrument was invented by Dr. Angus Smith, some years ago, by which the purity or foulness of air may be ascertained and recorded.
The air test and its value. One of these air-tests should be placed in every hospital and barrack, and a register kept of the daily observations. The result would be a most striking one, forcing conviction upon the most careless or prejudiced that the atmosphere, which appears in the day time to be pure and wholesome, becomes at night vitiated and unfit to be inspired.

15.—Inspecting Officers and Regimental Surgeons should, also, be called upon to make occasional visits to the barracks before the men quit them of a morning, and a standing order should be given regarding the keeping the windows or ventilators open. In many barracks that I have visited, I find no regulation on this subject enforced. In most cases the means for opening them were not available, from the ropes being defective, and a single string, if required, has to form the subject of an official application to the barrack department. All kinds of excuses were offered; the possible access of heat, dust, and rain were readily brought forward, but no thought seemed to be taken of the positive danger incurred by breathing an atmosphere, which at night is poisoned with the effluvia and exhalations given off from the bodies and lungs of sleeping men.

16.—The opening or shutting of a single window in a sleeping barrack, should not be left to the will of the soldiers, who are naturally ignorant of the conditions necessary to healthy respiration.
Windows.

17.—Every barrack should be provided with chimneys or flues, and ridge ventilation in the roof, and the condition of the air at midnight should be tested, in forming an opinion as to the number of men who can sleep in it without detriment to health. This would be a safer criterion to adopt than any amount of cubical or superficial space.
Advantage of chimneys in barracks.

18.—In hospitals, thermantidotes on an improved plan, and of much larger size than those generally adopted, should be used during the extremely hot months, wherever the number of sick exceeds a certain average. At night time, the *klus-klus tattee* should be dispensed with, and the external air simply thrown in.
Thermantidotes for Hospitals.

19.—“Blowers” of this kind are in operation at the Agra Central Prison, and it is proposed to introduce them extensively into the other large jails of the N. W. Provinces. They have been found to be most efficacious in remedying the one great evil I have attempted to describe, (an evil that can be proved to exist by any one who will take the trouble to do so) and, I think, that they ought certainly to be introduced into every Military prison in India, in which European soldiers are confined.
In use at the Agra jail.

20.—I beg to give the following brief extract from Dr. Walker’s last published Report ;
Dr. Walker’s opinion quoted. it is the result of 3 years’ practical experience gained by studying the health of a large body of men, exceeding 2,000 in number, who

are located in the Agra jail :

“ Theoretically, the standard amount of space appears sufficient ; practically, I believe, it is not so. If we could always supply a strong wind blowing through the barracks, well and good, but this is not the state of things in practice. Let us go into one of these barracks, in a still night in the hot weather or rains, and stoop down so as to be on a level with the stratum of air that lies dormant over the mass of bodies ; we then become aware of the condition of the atmosphere breathed by the prisoners. Their perspiring bodies throw out exhalations, which are either absorbed into the bedding to be thence evaporated, or hang in a cloud over them to be received over and again into their lungs. There is no means of getting rid of this cloud of noxious vapours completely ; increased height in the barracks will not affect it, for the exhalations, I complain of, gravitate downwards on the sleeping men, and ventilation, without a circulating current of air, will not accomplish what is wanted.”

21.—The truth of this statement I can bear witness to myself from my own personal observations, having, for many years, been accustomed to visit the sleeping wards of the Lahore jail at all hours of the night.

Personal experience at Lahore.

22.—But we cannot have pure air in our barracks and hospitals if a foul atmosphere prevails without, caused (as it constantly is) by badly constructed or ill-kept latrines and urinaries, cess-pools, or open reservoirs of fetid water from the wash-houses and kitchens, and neglected drains. With proper management, no effluvium should be perceptible from any of these places, and if it does exist, the converse inference is equally certain, viz., that there is want of proper supervision, or, in other words, neglect.

Latrines and urinaries.

23.—What can be effected in one Regiment can be equally effected in all, and the superior conservancy (as indicated by absence of all smell) which prevails in the lines of the 21st Hussars at Pesbawur, the 101st Regiment at Mooltan, and the Artillery at Jubbulpore, and which have been personally attested by the highest Military authorities, proves that it is not so much the building as the management of it, which is to blame.

Regiments in which they are well managed by the Medical Officers.

24.—At the same time, I am willing to admit that all regimental latrines have several defects. They have been constructed at a most unnecessary expenditure of money, on too large a scale, so that they keep off air from the barracks, require a large establishment for cleaning, and they are so deficient in ventilation, that, for want of an ample current of air permeating in every direction, they become permanent and intolerable nuisances.

Defects in construction.

25.—The latrines used in the Punjab jails are perfectly free from any effluvium whatever, and the essential points in which they differ from the majority of those constructed for Military use are as follows :

Advantages of the system in the Punjab jails.

- A. The absence of all masonry or pucca work containing lime cement.
- B. The prohibition of all cess-pools or reservoirs, and all drains or pipes, whether closed or open, leading in or out of the latrine or urinary.
- C. The prohibition of water being used to flush the ground or flooring, which is to be kept perfectly dry.
- D. The flooring being of earth, (instead of pucca masonry or stone) on which dry sand to the depth of 4 inches over a layer of well rammed clay is strewed, and the portable vessels for

the reception of both fluid and solid refuse matter being deposited on the sand.

E. The immediate removal of all refuse matter from the latrine itself, and the careful burial every evening in trenches dug for the purpose.

F. The abolition of the practice of sprinkling powdered lime in the urinaries and latrines, or in any other spot.

26.—That these several differences are very essential ones, and that much advantage, both in a sanatory and financial point of view, would be gained by the practice which obtains in the Punjab jails being extended to the barracks in which European troops are located, I will attempt to show *seriatim*.

Essential differences in the
barrack system.

27.—It is a well known fact that the acid contained in urine (known by the name of uric acid) has a strong tendency to combine with lime in any shape, and the new compound formed thereby is highly offensive from its strong ammoniacal odour. It is this which produces the overpowering fetor in all urinaries where lime-stone, or pucca cement containing lime, is used, and there is no remedy but to break up and remove the entire brickwork with its coating of concrete, a troublesome and expensive process, especially as it has to be done constantly. The destructive effect produced by urine on lime cement, cannot fail to be apparent to any one who takes the trouble to examine one of the urinaries attached to a European barrack, and the effluvium is perceptible to a painful degree even before entering the building. Stone slabs are only one degree less objectionable than pucca masonry, as they are mainly composed of lime-stone joined together with lime cement.

Action of urine upon lime
and concrete.

28.—For the same reason, all drains or conduits, however small, should be prohibited. They soon become saturated and tainted with the ammoniacal odour, which no washing or flushing with water can remove; they are, also, constantly made use of improperly, and every modification and plan of copper and zinc tubing, stone drains, and leaden piping, has been tried, but all have been condemned from the urine infiltrating and finding its way beneath, where it remains giving rise to a constant and irremediable stench, which is communicated to the clothes of those who enter the building.

The evil of drains.

29.—The superiority of the dry over the wet system, or, in other words, the total abolition of the use of water for flushing the urinaries, requires but ocular demonstration to convince the most sceptical or prejudiced. In theory, the idea of a stream of water constantly flowing through the urinaries appears perfect; in practice, it is known to be a total failure, because the urine is passed above and below, and on the sides, while the water itself merely trickles along a small portion of the conduit; added to this, the water after flowing through the urinary becomes itself polluted, and has to be got rid of. It cannot be used to lay the dust or water the road, and hence expensive cess-pools are dug to receive it, where it remains stagnating and offensive, or it occasionally bursts through the surface of the ground, in close proximity to the sleeping barracks, and even the wells which supply the troops with drinking water. This has happened at Meean Meer more than once, as well as at Sealkote.

Superiority of the dry sys-
tem.

30.—By placing the urinaries under the same roof as the lavatories, the former are

Objections to joining the lavatory with the urinary. brought too close to the barracks, and the damp and wet from the water used in washing destroys the perfect working of the system, which is essentially opposed to all moisture and wet.

31.—The sprinkling of powdered quick-lime is proved to aggravate the evil, by causing the evolution of fetid ammoniacal gas on its meeting and combining with urine. Quick-lime, it is true, destroys animal matter, when buried with it beneath the surface of the ground, but no such decomposition is effected when it is exposed to the open air ; and as a deodorizer, especially when applied to urine, it only increases the effluvium it is intended to destroy.

32.—But further, it is positively injurious, as it serves to conceal filth that ought to be removed. In the course of my late tour of inspection, I have frequently detected the sweepers in the act of covering over with lime the filth they had neglected to take away.

33.—Moreover, putting out of the question the cost, which at some stations amounts to 800 or 1,000 Rupees per annum, it is never used in our own houses, where it certainly would be of any real practical benefit.

34.—The only remedy for these evils, and they exist to a greater or less degree at every station in India, is to break up and remove all the old flooring, plaster, and masonry work which has become in any way offensive, to destroy and fill up all cess-pools and drains, and to increase largely the ventilation by turning small arched openings at the base of the rear wall for the removal of the pans, and making apertures of ample size below the roof, on all four sides of the building, so as to establish a thorough lateral current.

35.—The seats of the latrine should be in every case of wood, with circular apertures, and the pans should be either of iron, according to the standard pattern approved of by the Government of India in September 1858, or of earthenware which is less costly, and much more easily kept clean.

36.—A large iron receptacle with close fitting lid should be kept in the rear of each latrine, and removed morning and evening ; but a sweeper must attend at the spot throughout the day, to empty the pans as they are used into these receptacles, and to keep the seats, floor, and vessels scrupulously clean.

37.—The urinals should, also, be the upright iron pattern sanctioned at the same date ; they should be placed on sand, in a common circular earthen dish containing charcoal, to prevent the floor being accidentally soiled, and care must be taken that they are never permitted to overflow.

38.—The urinaries ought to be small detached buildings, partly open on all sides, and as close to the barracks as practicable, both for the convenience of the men, and to prevent other places, such as the lavatories, being improperly made use of, as they are at present.

39.—Instead of lime, wood ashes from the cook house, and the refuse dust of charcoal too

Substitute for lime.

small to be used for any other purpose, are found to be of real efficacy ; and a heap of this, ready mixed, might be always kept at hand to sprinkle in the pans used in the latrines, as well as in the large iron receptacles kept outside, in which the filth is deposited until the conservancy cart arrives to carry it away to the trenches.

Water from lavatories.

40.—Lastly, the surplus water from the lavatories and baths, instead of being allowed to pass into deep cess-pools, should go to the soldiers' gardens ; or, if these do not exist, it should be collected in open circular tanks, and be emptied by hand every night and morning, being then used to water the roads or sprinkled on the ground round the barracks, by which means dust and dirt are lessened, and the tendency to ophthalmia prevented.

Results of the system.

41.—Such have been the effects, combined with the lessening of disease and the reduction of expense, that have resulted from the system in the Punjab jails ; a system which has been abundantly tested during the last ten years, and to the efficacy of which the Government of this province has repeatedly borne witness.

Opinion of the Commander in Chief

42.—On the occasion of His Excellency the Commander in Chief visiting Lahore in December last, he inspected the Central jail which contains 2,200 prisoners, and after minutely examining the details of the system, he was pleased not only to express his thorough approval of the plan, and to admit its merits, but he gave orders for it to be adopted at some of the principal Military stations without delay.

Model urinary and latrine designed by Dr. Hathaway.

43.—Previous to this, I had also designed a model latrine and urinary, which after being approved of by the Quarter Master General of the Army, and the Chief Engineer in this province, the Punjab Government has directed to be constructed as an experimental measure in every station where European troops are located. They not only combine the principles and advantages I have described above, but occupy a very small space, are easily kept clean, and can be erected for a tenth part (or less) of what the ordinary buildings cost. A plan with specification of details is furnished in the appendix. [*Marked A.*]

Adopted at every station for trial.

44.—They have now been in use at several stations for a period varying from four to six months, and the reports of the Military Committees ordered to enquire into their working have begun to come in. Those from Jullunder are appended, (C) but my Report would have been seriously delayed if I had waited until all had been submitted.

Practicability of altering the present latrines.

45.—To obviate the necessity of constructing one of these buildings for every barrack, I turned my attention, in conjunction with different Engineer Officers, to the feasibility of altering the present latrines and urinaries, so as to embrace the main advantages of the plan I advocate. This has been done as an experimental measure at Lahore, Jullunder, Peshawur, and elsewhere, with perfect success, and at a mere nominal cost.

46.—But, before dismissing this part of the subject, it must be emphatically stated that

Daily supervision absolutely necessary. unless a thorough and complete system of regimental supervision be kept up, not only for a certain period but throughout the year, neither this nor any other scheme for improving the conservancy of the European lines will succeed.

47.—There must be a perfectly organized plan, with rules for the guidance of each individual, and not only must every one—from the sweepers up to the Regimental staff—have his own separate duty assigned him, but, in case of neglect, the responsibility must be fixed upon some one against whom the neglect or want of supervision rests.

48.—It is one thing to give an order, and another to see it properly carried out ; but in a regiment, where we see such close attention paid even to little matters, there can be no difficulty in laying down an efficient plan and having it acted up to. As long as there is any thing to offend the senses, the supervising Officer may rest satisfied that the system is only imperfectly followed, and no excuse should be accepted in justification.

49.—At each latrine one of the sweepers must be stationed during the day ; they can make their own arrangements as to relieving each other, but the present practice of allowing them to be absent through the greater part of the day in the bazaar, or at their own homes, or smoking in the cook-houses, should be peremptorily put a stop to : nor should they be employed in attending to dogs or poultry belonging to the men, or any other duty whatever.

50.—The greater the number of supervising Officers and the oftener the latrines are visited, especially at uncertain times, the greater will be the degree of cleanliness maintained, not only by the sweepers but by the soldiers themselves.

51.—I am constantly told that the establishment allowed by Government is too small to work the system efficiently, but I cannot say that I admit it. What is required is method, and I conscientiously believe that, if double the number of sweepers were entertained, there would be no real improvement.*

52.—These men waste a great portion of their time and labour in merely sweeping up leaves, dust, and litter from the high road in cantonments, or the main streets in the bazaar and lines, while large accumulations of filth and refuse matter are concealed from view, and left to poison the atmosphere where it is not seen.

53.—An inspecting Officer should walk down the rear of his lines, and a Magistrate go into the back streets and lanes of a city or bazaar, if they wish to know the true state of things under their charge. It is in these places that small-pox and typhoid fever have their origin, but it must be remembered that, although generated, they do not remain there. We ourselves may never enter such plague-stricken

* Note.—See the report of the Delhi Committee (Marked D,) confirming my opinion on this point.

spots, reeking with the stench of foul drains and putrid matter of every description, the garbage of the slaughter-house, and the offal from the cattle-yard ; of unwholesome trades carried on in dirty houses which are never cleaned, never white-washed, which from year to year are never ventilated by the pure air of heaven, and in which, after death has entered and the corpse been removed, no sanitary measures are ever adopted for the purification of the building.

54.—But our tradesmen, of whom may be specially mentioned the baker, the butcher,

How extended to the Officers and troops.

and the milkman, as supplying us with the daily necessities of life, and the families and relatives of our domestic servants, all live in

these fearful spots, and in this way disease is brought to our own thresholds. No personal precautions on our part can prevent this, unless we strike at the root of the matter and remove the evil at the fountain head.

55.—I am of opinion that the trenches in which the filth is deposited, should be excavated

Trenches for burying filth.

and filled in by Bildars or Coolies, but not by the sweepers, whose sole duty is in the lines. I think, also, that a conservancy cart

should be allowed to each European hospital, as was formerly the case, and that the filth from the Regimental and Sudder Bazaars should be removed by the same means. It is quite useless to expect that men can or will do this work efficiently ; they may go through the form of carrying away a basket of litter, but the worse kind of filth is either concealed, or thrown down into the first ditch or hollow they come across.

56.—The fluid refuse should not be poured into the trenches, but into circular pits, as it

Not to be used for fluid refuse.

would necessarily flow over the bottom of the whole trench, and become an insufferable nuisance.

57.—The common carts, and wretched cattle of the country, should not be used for con-

Conservancy carts.

servancy purposes, as the slowness of the pace, and the smallness of the load, prevent any efficient cleansing of the lines daily as it

ought to be done. I trust to see carts built on a proper model, lined with zinc or sheet iron, and made to tilt up from the axle, so as to admit of being immediately emptied. Commissariat bullocks ought to be allowed by the Department, as is done in many stations.

58.—Another very necessary caution is not to let the trenches be too far off, so as to

The trenches to be near the station.

prevent the carts from making three trips, at least, every day. By the present vicious system, the whole accumulation of the day re-

mains in the latrines from 7 o'clock in the morning till 5 or 6 in the evening, and it is here where the real danger lurks during an outbreak of cholera. It should be remembered that the object is to remove the excreta rapidly and frequently, and the plan of burial in the trenches is so thoroughly effectual, that it is far better, in a sanitary point of view, to have the trenches half a mile distant, and thus be able to clear away all refuse matter three times a day, than to take it double that distance, and only make one journey per diem. This mistake I find existing at every station, and it is a very serious one. In our jails, all the refuse is buried in the garden, and being rapidly decomposed, from the shallow depth of ground it occupies, no inconvenience is ever experienced.

59.—Whether the evidence furnished by such high authorities as Liebig and Alison, who show most clearly that Cholera is caused by the exhalation from faecal exhalations. Cholera propagated by faecal exhalations. matter, be accepted by us or not, it is clearly our duty to guard against the *possibility* of risk from this cause ; and it may, with great reason, be shown that the European soldier has to visit this focus of contagion every day, which the Officer is exempted from. This may have more to do with the different ratios of attack and mortality in the two classes than is generally surmised.

60.—I believe myself that the custom and habit of the Asiatics in this respect, is much more consistent with true sanitary science than the use of public latrines, which we are trying to introduce among them. It is the concentration of decomposing animal matter in one spot that in a tropical climate renders it so dangerous to health, added to the necessity of removing it sufficiently often, and which, if found to be a matter of such difficulty in the case of a single Regiment of 800 men, would be an impossibility with the dense population of a large city.

61.—Certain it is, that the practice of the natives of this country is in strict accordance with the Divine ordinance that was given to the first great camp the world ever saw, and the general laws for the preservation of health and prevention of epidemic disease or contagion, are as applicable to India in the present day, as they were centuries ago to the children of Israel.

62.—It is a startling fact that at the time of the Cholera visiting England, the one class of people who almost totally escaped its ravages were the Jews. This statement is given on the authority of the Registrar General, and it will be found as follows in the report of the Committee appointed by Government :—(*Page 82, of Appendix by Professor Grainger.*) “In the great epidemic in London, of 1849, the exemption of Jews from Cholera was most remarkable. It is calculated that, out of 20,000 Jews residing in that city not more than 13 died from the disease, whilst the deaths from Cholera immediately round them amounted to 12,837. This would give to the Jews only 6 casualties in 10,000, whilst in Rotherhithe 200 in 10,000, in White-Chapel 60 in 10,000, in Shoreditch 90 in 10,000, and in the city of London 70 in 10,000 succumbed to it. These districts only are selected for the sake of comparison, as the Jews muster there the strongest.”

63.—The result is attributed to the extraordinary care with which the cattle used for meat are selected, and the scrupulous precautions adopted against diseased or unwholesome food ; this is done by employing inspectors to examine both the animal and the carcase, before and after death. No Jew ever purchases meat from an ordinary butcher’s shop, or without ascertaining that it has the prescribed mark, which is affixed by means of small tin tickets bearing the stamp of the High Priest or his representative.

64.—In India, the Parsees are known to suffer less in proportion than any other classes ; they occupy good houses, are very cleanly in their habits and dress, and consume wholesome food. In comparing different bodies of

European soldiers, the Artillery have fewer casualties than any other troops ; they are seldom over-crowded, get a variety of food from their own private mess fund, their duties are not trying, and they have much less night duty or exposure to weather.

65.—Amongst the individuals composing a European Regiment, and who occupy the same building and, hence, breathe the same atmosphere, the statistical tables, that have been compiled from the official returns furnished by the Medical Board for a period of several years, show conclusively that the smallest ratio of deaths from Cholera occurs amongst the children, the next amongst the women, and the highest amongst the men. The difference may be easily accounted for, on the broad laws that have been every where recognized as effecting a predisposition to the disease. The men are exposed to fatigue and weather, are more careless of their health, and have their constitutions more or less weakened by intemperance and other vices. The women are of temperate habits, have no duties which cause them to be exposed to the sun, rain, or night air, never sleep on the ground or out of doors, and have more resources in their family duties to occupy their minds ; they do not smoke, and do not therefore require an inordinate quantity of water to satisfy their thirst. The children have lighter clothing which is oftener changed, and are bathed frequently, while their diet is more simple, and yet more varied ; they partake sparingly of water, suffer no exposure, and are not depressed by fear on the outbreak of an epidemic.

66.—On the subject of food, there are a few points which come within the scope of my enquiry. Generally speaking, I consider that the rations supplied to the European soldier, when proper supervision is maintained, are of good quality, and fully equal to what many Officers obtain. But, I think, that a greater variety, and better method of cooking, is urgently required. Less meat should be consumed in the hot weather than in the cold season, and instead of beef being served out 5 times a week, and eaten twice a day, it would be much more conducive to health if curries, stews, soup, fish, rice, and puddings, could form part of the dietary, for two days in every seven.

67.—I see no difficulty, if the Officers of the army would take up the question, why a comfortable mess, with the adjuncts of a clean table cloth, delf plates and mugs, might not just as easily be effected for all, as it is in the artillery, instead of letting the men dine off bare tables, eating their food from tin panikins, in a rough kind of manner, with a feeling that the meal is not enjoyed and appreciated as it might be.

68.—The fire-places, instead of being composed of a few loose bricks or pieces of mud put up by the cook-boys, ought most certainly to be built by the Public Works' department, and be kept in proper repair. The best plan that I have seen, is in daily use at Sealkote, constructed by the Surgeon of Her Majesty's 7th. Dragoon Guards. It appears to have all the advantages of Captain Grant's patent, without being expensive either in its structure or the amount of fuel required. A thin plate of sheet iron going over the whole, enables the soldier to warm his cup of coffee or tea at any

time in a few minutes, which cannot be effected at the present open fire-place ; the smoke, also, is consumed, and there is a great saving in the wood expended.

69.—It being proved on the most conclusive evidence, as witnessed at Meean Meer, where the experiment was fairly tried in the presence of the Commissariat and other Officers of the Staff, that sheep will greedily partake of human ordure, even if they have been otherwise properly fed, I would strongly urge the necessity of never allowing the animals to be kept at the cattle-yard, or in the precincts of cantonments, where, in going out either to graze or drink water, they must necessarily pass over ground which will supply them with the means of gratifying their depraved taste, and which no care on the part of the shepherd can possibly prevent.

70.—I would have paddocks set apart at some considerable distance beyond the cantonment boundary, just as the grass preserves for the use of the Cavalry and Artillery are at present. An enclosing wall and shed should be erected, and the contractor should be bound to keep his sheep there, and in sufficient numbers. How to be prevented. What is done for the benefit of the Government horses might be equally done for the benefit of the soldiers. It would relieve the Commissariat from much opprobrium, and would satisfy the minds of both Officers and men, nor could any difficulty be raised on the part of the contractor, if it formed a regular clause in the contract. In each corner of the enclosure a large lump of salt should be kept throughout the year.

71.—With regard to water, although it is a point of vast importance, yet on no subject have I found such great indifference and ignorance, in the course of my tour of inspection. While the Natives of this country are most particular in selecting the water they drink from the best and cleanest source, so much so that, in every station, there are one or two wells, which, “par excellence,” have gained a fixed reputation, and to which every one resorts, the British soldier appears to be perfectly careless on the matter, so that he gets enough ; and the quantity consumed in the course of the 24 hours, during the hot weather, is enormous.

72.—In very few stations is the water filtered, even for the sick in hospital, and I failed to ascertain that it was done regularly any where, except at Peshawur. In the jails of the Punjab it is now a standing regulation, that, during four months in the year, viz. from June to September, all water used for drinking purposes is to be not only filtered but boiled, and I believe it to be a measure of great prophylactic value.

73.—When it is considered that the wells in this country are all open, that the water is close to the surface, that leaves of trees, dust and dirt of every description, and frequently insects and reptiles may be seen floating on the surface ; that the water is carried in bags made of the skins of animals very imperfectly tanned, and used promiscuously either for drawing stagnant water out of a ditch or tank, or that required for drinking purposes ; that there is no method of cleaning this bag or even of opening it to examine how dirty it may be inside ; that in nearly every water-jar (where special

care is not taken to prevent it) will be found organic vegetable and animal matter, frequently in the shape of worms and animalculæ visible to the naked eye, is it wonderful that health gives way to disease, and that fever, diarrhoea, and dysentery so abound ?

74.—The recent discoveries made by analysis of the different wells in London, abundant-

Purity of water only ascer- ly prove that water may have all the external signs of being whole-
tained by analysis. some, that it may be bright and sparkling in appearance, cool and agreeable to the taste, and yet that these very qualities of transparency and coolness are produced from the decay of organic matter, with which it had been previously contaminated.

75.—But by boiling, the germs of vegetable and animal life are destroyed, the earthy

All impurities got rid of by and saline particles which are held in solution are precipitated, and,
boiling. all noxious matter being thus eliminated, nothing more is required than to allow the water to cool slowly in the vessel in which it has been boiled, and then to pass it through a filter of sand and charcoal, which completely restores its briskness and taste.

76.—Another point in which the conservancy of jails is superior to that of barracks in

System of washing the this country, is the great care bestowed on the constant washing of
walls, &c., in jails. the floors and walls, which otherwise would become animalized—so to speak—by the effluvium and emanations from the human body, and are capable of exciting or predisposing to disease of the deadliest character. This is the most fruitful source of infection, where any large number of persons occupy the same building by night and day, and every care is required to guard against the danger, which, though unseen, is capable of being demonstrated in a palpable manner.

77.—In fact, both reason and experience show us that, it is as necessary to present a fresh

Sanitary advantages of do- and clean surface when the floors and walls are thus animalized from
ing so. the exhalations of the human body, as it is to move a standing camp after the expiration of a few weeks to fresh ground. This is attempted partially in our barracks by white-washing, but it is done only once or twice a year, which is useless. In the jails of the Punjab it is a standing regulation, rigidly enforced, to wash the floors (and walls to the height of 6 feet) with a solution of clay and cowdung laid on very thin, three times every week. It is a custom adopted from the Natives, and extensively practised in all parts of the Empire, especially in the Bombay Presidency. Not only is the atmosphere of the apartment found to be cooled and purified thereby, but all vermin, which so abound in the barracks of our European soldiers, and cause such annoyance and loss of sleep, are thereby effectually destroyed.

78.—In the Central jail at Lahore this washing is done daily, the wash being prepared

Immunity of the Lahore from a species of “fuller’s earth,” which dries of a light color, and
jail from cholera in 1861. has a cool and clean appearance. In August last, when the Cholera was raging in the barracks at Meean Meer, and the mortality reached nearly 25 per cent, so that a fourth part of the garrison was destroyed, not a single case appeared among the inmates of the prison, (comprising 2,200 convicts and 200 guards) although the building is situated in the same plain, and within $2\frac{1}{2}$ miles of the barracks, with nothing to intercept or deflect the course of the wind.

79.—Personal cleanliness is not enforced amongst the troops so much as it should be, especially in a tropical climate. If we consider that every adult ex-
 Personal cleanliness. hales by the skin and lungs, in the course of 24 hours, three pints of moisture “loaded with organic matter ready to enter into putrefaction,” that in disease it is both greater in quantity and still more noxious in quality, and that it is necessarily absorbed by the clothes and bedding, can we wonder on being told, by those who have paid the subject most attention, that this noxious matter, if not removed, is again absorbed into the body by the action of the cuticle, and that poisoning by the skin is as certain and deadly in its effects as poisoning by the mouth?

80.—The main point in all sanitary suggestions, in my opinion, is constantly to insist upon the fact, until we fully realize the idea and have it vividly im-
 Secretions of the human body noxious to health. pressed upon our memory, that the secretions of the human body are in themselves noxious, and that our duty is to assist nature in her efforts to remove the elements of danger, instead of concentrating and intensifying the poison. This is the real object in bathing, in wearing clean clothes, in exposing bedding to the atmosphere, in cleansing the floors and ventilating the rooms of our dwellings, and establishing a proper system for carrying away and burying all excrementitious matter.

81.—A point on which a few remarks are needed, is that of trees in cantonments. I believe, from the facts that have been officially brought to my notice,
 Trees, their use in a sanitary point of view. that much harm is done by the indiscriminate cutting and lopping that occurs in many stations, when an epidemic appears. Instead of being taught to consider trees as a valuable protection against malaria and contagion, we are, without any reason, made to look upon them as the promoters of disease. But, this is directly contrary to fact. We have not only conclusive proof that stations have been rendered permanently unhealthy by cutting down trees, but our common sense shows us that, if injurious, the health of the Officers, whose houses are surrounded by them, would necessarily be worse than that of the private soldier who occupies a barrack on an open plain. That they have nothing to do with causing cholera, is clearly proved by the fearful experience gained at stations like Meean Meer and Kurachee, where it is difficult to get any tree to grow.

82.—I would advocate not only the encouragement of soldiers' gardens, but I would specially urge the advantage of grass and trees being planted, so as to afford
 Soldiers' gardens. protection from dust, and a constant relief from the glare and reflection that meets the eye on all sides of the soldiers' barrack and hospital. The small strip of ground required for this purpose would not interfere with the parade ground, and it would provide amusement and occupation to the men, as well as an agreeable change to the women and children. But, assistance must be given by Government. At present, soldiers' gardens fail from want of water, from their being too far distant from the barrack to be a source of enjoyment, and from their being necessarily neglected when a regiment is moved to another station.

83.—If the grass, trees, and garden were to be considered as forming an essential part

The advantage of grass and trees near the barracks.

of the barrack square, the trifling expense required in keeping them up would be amply repaid to the State by the advantages resulting therefrom. A comparison of the hospital returns would alone prove this, for ophthalmia, which is so common in many stations among the troops, is now unknown in the Punjab jails, and it is attributed by the Medical Officers to the measures described above, which have been for some years adopted in our prisons.

Light.

84.—Next to air comes light, and here there is great room for improvement. The lamps provided in the barracks and hospitals can only be designated as unworthy of their name and object.

The bad lamps in barracks, how to have the evil remedied.

85.—I would again urge the advantage of evening—and not day-inspections, towards remedying the evil. Let periodical reports be sent in, showing that the barrack is gloomy and the atmosphere smoky, that the men cannot see to read or write, that they are forced either to provide lights of their own, or that they lounge about in idleness and dullness, driven from sheer ennui to the canteen, or—still worse—to the bazaar. The reading-room, unless established in each barrack, as is the case in the 7th Dragoon Guards at Sealkote, does not meet the difficulty; all the men could not gain admittance if they wished, and the sick in hospital, the women and children, are not allowed to enter. Let any one visit a barrack in the long winter evenings, and say if the picture is overdrawn.

The best kind of lamps.

86.—The best kind of lamps for constant use are the ordinary American ones; they burn any kind of oil, give a clear steady light, are easily cleaned, and do not get out of order. If purchased wholesale, they might be landed in Calcutta and Bombay for a very small sum. The best proof of their being the best and cheapest kind available is, that they are used in the soldiers' reading-rooms and theatres, and the messes of the Non-Commissioned Officers.

The case not fully understood by Government.

87.—Of this, I feel convinced, that if the existing state of things were known and understood by the Government, it would be altered without delay. It is incumbent on every one who has the interest of the European soldier at heart, to represent the matter earnestly and perseveringly until the evil is remedied. And let it be clearly stated that, it is not the mere state of discomfort and inability to do any thing without better light that I consider so objectionable, but the results to which it leads.

Evils resulting from want of light in the barracks.

88.—The hours that hang heaviest on the soldier in this country are those of the evening, and, at the same time, they are the hours which are fraught with the greatest danger. Instead of being driven to beguile the time in the bazaar, where intemperance, vice, and disease await him, every inducement should be offered to make the barrack of the soldier not only his home but a comfortable one.

Social vice a great source of disease.

89.—The subject naturally leads to the consideration of social vice, and it is this point which I have purposely reserved to the last, because I believe it to be the greatest source of disease among the British troops in this country, and the greatest cause of their being predisposed to the attacks of cholera, fever, and

dysentery, which the Officer living in the same station, breathing the same atmosphere, and occupied in the same duties, finds himself exempt from.

90.—I am aware that the enquiry is one which is frequently evaded by writers on military sanitation, and passed over in the annual reports of Medical Officers, through false delicacy, or in the hopelessness of suggesting any practical remedy. But, the question is of vital importance. It affects the present as well as the future health of thousands—of the child unborn—the girl just married—and every rank and class of our soldiery, from the recruit recently arrived from England to the broken down and prematurely old invalid, who is being sent out of the country incurably destroyed, at an age when other men are in their prime of life.

91.—Not only does venereal disease keep a large proportion of the army constantly in hospital, but the necessary treatment combined with the ravages of the disease, undermines the constitution, cripples the bodily powers on the march or in the field, and predisposes to other diseases, especially rheumatism, which affection swells very largely the annual number invalided and in hospital.

92.—The Medical Returns of the Principal Inspector General's Office, and other authentic records, show the following to be the number of soldiers annually treated for Syphilis alone :—

	Annual admissions, to strength.	Period of observation.	
Bengal Army, ~ ~	17 per cent.,	Average of 6 years,	1850 to 1856.
Madras Army, ~	22 „	do. 20 years,	1829 to 1838.
			1842 to 1851.
Bombay 1st Fusileers,	25 „	do. 8 years,	1846 to 1853.

93.—In 1861, the general return of the whole Bengal Army submitted to the Commander in Chief, showed that, in the month of August, 1,734 men, (equal to two whole Regiments) out of a strength of 40,731, or 51 per 1,000, were treated for venereal affections in the European hospitals during the month. This number proves how enormous must be the aggregate in the whole year.

94.—For forty years, viz from 1797 to 1835, Lock hospitals were in existence in the three Presidencies, one being established at every large Military station. They were abolished in Bengal in 1830, and in Madras five years later, but, though badly managed, being left almost entirely to Native agency only, the following statement, prepared by Dr. Waring from the returns in the Office of the Medical Board, shows how fearfully the disease increased after their abolition, proving incontestably that they *must* have been of real efficiency in checking the virulence of the scourge.

	Years.	Per-centage of admissions (for venereal disease) to strength.	Remarks.
Lock Hospitals in existence.	1829	11.6 per cent.	
	1830	10.6 "	
	1831	11.8 "	
	1832	14.0 "	
	1833	26.8 "	Year of famine.
	1834	32.2 "	Ditto.
Lock Hospitals abolished.			Prostitution increased a hundred fold, as a means of existence.
	1835	28.4 "	Lock Hospitals abolished.
	1836	26.1 "	
	1837	24.2 "	
	1838	26.8 "	
	1842	20.5 "	
	1843	17.5 "	
	1844	16.0 "	
	1845	19.6 "	
	1846	20.9 "	
	1847	29.7 "	
	1848	35.9 "	
	1849	32.7 "	
	1850	28.1 "	
	1851	27.1 "	

95.—On the other hand, by the system pursued in the Belgian army, syphilis appears at the present time to be almost unknown. At Brussels, in the year 1859, out of a garrison of 3,500 soldiers only eleven men were in hospital, and a great diminution in the prevalence of the disease among the civil population had also resulted, so that, whereas in London every fourth man suffers from syphilis in some form or other, in Brussels the proportion is only one in fifty-six !*

96.—During the last two years a Lock hospital has been established at Lucknow and Lahore. The working of the latter has been fully reported upon by Dr. Ross, Surgeon to H. M's. 21st Light Dragoons ; the result at the end of the year, was not only a decrease in the number of prostitutes of nearly 32 per cent., but a remarkable diminution of cases of disease occurring amongst the soldiers, while at the same time, the disease was of a much milder nature. This last point is too much lost sight of. It is the virulence of the infection that is most to be dreaded, and which, in tropical climates and among an Asiatic population, has always a tendency to be increased or intensified by the duration of the disease.

Note. * These statistics have been obtained from the valuable articles on the health of the European Army published by Dr. N. Chevers in the "Annals of Indian Medicine."

97.—Out of a long array of names of Medical Officers who have urged the absolute necessity of re-establishing military Lock hospitals in India, on the same system which has proved so effectual in the Continental armies, I would only mention those of

Dr. C. Mackinnon, Inspector General of Hospitals, Bengal.

Dr. F. J. Mouat, Inspector General of Jails, „

Dr. Norman Chevers, Secretary to the Medical Board, „

Dr. Arnott, Deputy Inspector General of Hospitals, Bombay.

Dr. Murray, Deputy Inspector General of Hospitals, Madras.

who have all written strongly and earnestly in favor of the measure. Higher authority or greater talent and experience could not be sought for, and the necessity of the provision may be at once admitted.

98.—But, if the re-institution of these establishments on the Continental system be not sanctioned, I would suggest the advantage of a Venereal ward being added to every Government dispensary, and that all public diseased women be sent there for treatment, by the co-operative agency of the local Civil and Military authorities.

99.—The Cantonment Magistrate, Kotwal, and Bazaar Sergeant, actively assisting the Quarter-Master, Medical Officer and Provost Sergeant of a Regiment, and working on a carefully elaborated plan, under the encouragement of Government, would very soon reduce the fearful pest that is destroying the vitals of our army in India, to a minimum amount of danger.

100.—Every prostitute residing either in the Regimental or Sudder Bazaars should be registered, and her dwelling place numbered, so that not only could a soldier at once point out the place where he contracted the disease, but the house would be marked and avoided by his comrades. She should be removed to the dispensary when ill, placed in a separate ward with enclosed yard, and supported while under treatment by the allowance of daily rations, just as other poor patients are. A certificate should be given to each as a voucher for her being allowed to live in the Bazaar, and on this certificate each admission to Hospital, with the date of her being discharged cured, should be recorded.

101.—They should be examined every week by a Medical Officer specially selected, who should receive an addition to his pay, as a fixed staff allowance for the duty. Any woman not attending, to be fined for the first omission, (unless she be in Hospital) and turned out of the Bazaar on any future neglect of a rule on which the successful working of the whole measure would mainly depend.

102.—The expense might be entirely defrayed out of the Canteen and Grazing funds : from the latter a large balance is in hand in many stations. Such a system, superintended by Officers *directly chosen* for the duty, and who evince an earnest desire to benefit all classes alike, by mitigating a disease of the direst na-

ture, terrible in its suffering as well as devastating in its effects, a disease that is rapidly sapping the efficiency of our army, and reducing it, in fact, to only a proportion of its nominal strength, would produce immediate and permanent good results, as has already been abundantly proved in the French, Belgian, and Prussian armies.

103.—Without opening up the question either of morality or expediency, let us take the high and broad ground of humanity as our gauge. If the law prohibits the sale of noxious liquor in cantonments, why should it not equally prevent a more deadly and subtle poison from attacking the troops located there? If it provide Leper Hospitals and Lunatic Asylums for one class of diseases, and *compel* the removal of those so affected for proper treatment and separation from the mass, why should it not act with equal decision and promptness in the case of those, who are not only diseased themselves, but communicate the disease to others with a certainty and malignity that is unknown even in the most contagious maladies, and with such unerring rapidity, that it is increased a thousand fold within a brief period of time; while the future effects on the system are equally destructive, causing death, broken down constitutions, and injury to the second generation by an hereditary taint being communicated to the offspring. The validity of the argument is admitted in the case of a person affected with small-pox, who is prevented by law from appearing in the public streets; why not, with equal firmness and justice, apply the same rule in dealing with a disease equally communicable?

104.—On financial grounds, the question admits of still less discussion, being confined within very narrow limits. Year after year, the returns published under authority show that sickness, mortality, and invaliding, are greater among the European soldiers in India than that of any other class; and if this excess is caused in any way (as is shown to be the case) by *preventible* disease, or defective sanitary arrangements, the expense of renewing the perpetual loss by a fresh supply, the sending out batches of young recruits to fill up the gaps in the ranks of trained and disciplined soldiers, is a far more costly system than the simple precautionary measures that have been persistently advocated by abler pens than mine. The Government shows a liberal and humane policy in the treatment of the sick, as testified by the spacious Hospitals, profuse supply of medicines, and highly paid staff of Medical Officers. Let an equally sound policy, and better economy both of life and money, be established by the *prevention* instead of the cure of disease.

105.—The special evil that I have described is one that cannot remedy itself; it is increasing daily with more and more deadly effect, and the time has come when some organized plan for the mitigation or removal should be attempted. I have offered these remarks for the earnest consideration of Government, being convinced that it is a subject which must be grappled with, and that promptly and energetically, if we wish to save our army from further inefficiency and decay.

Stations visited.

1. Umballa,
2. Delhie,
3. Meean Meer,
4. Sealkote,

106.—I proceed now to the consideration of those points, illustrating much of what I have stated generally above, which presented themselves to notice during my sanitary inspection of the Stations marginally

5. Murree,
6. Rawul Pindee,
7. Attock,
8. Peshawur,
9. Nowshera,
10. Campbellpoor,
11. Dera Ismael Khan,
12. Mooltan,
13. Umritsur,
14. Jullunder,
15. Kangra,
16. Dhurmsalla,
17. Jutogh,
18. Subathoo,
19. Dugshai,
20. Kussowlie,
21. Phillour,
22. Ferozepoor,

noted ; it being merely necessary to premise that in every case, due notice was given of my intended visit, and also that my observations were made, and notes recorded, in the company of Officers deputed by the commanding authority to accompany me in my inspection.

UMBALLA.

107.—The European Infantry barracks, occupied by H. M's. 89th Umballa. Regiment, were visited on the 3rd of November.

108.—The latrines are well and substantially built, but very offensive from want of ventilation and defective internal arrangements. No pans or vessels are in use, but sloping channels are formed of pucca masonry, with apertures at the base of the rear wall. The solid matter, as might be expected, does not pass freely through these channels, but remains adherent to the pucca work. Outside, there is a deep V shaped drain, through which both fluid and solid refuse is swept into an open reservoir or cess-pool, where it remains throughout the day. The bottom of this channel becomes clogged with filth which no sweeping can remove, and the sweepers, therefore, content themselves with sprinkling lime on the top and sides, to hide their own failure. There is no lid or cover to the cess-pool, and the effluvium, both inside and outside the building, is very overpowering. There are small superficial drains intended apparently for the flushing of the big one, which contain much faecal matter, and this runs out and escapes on to the open ground.

109.—Each of the double latrines in these lines cost 3,066 Rupees, and the single ones 1,533 Rupees. One of the latter has been altered, since my inspection, at a cost of 50 Rupees, so as partially to adapt it to the plan of the model one, by removing the masonry "choolas" and terrace flooring, and enlarging the openings in the walls.

110.—A new latrine, according to the design shown in the appendix, (A.) was commenced during my visit to the station, in which the essential points of free ventilation and the absence of lime in any shape were secured. The cost was 173 Rupees. It has now been in use 5 months, and separate reports from the Medical Officers of the different regiments have been received, all agreeing in the opinion that it fully answers the purpose intended, that it is amply large enough for one Company of men, and that no bad effluvium exists.

111.—There are two urinaries on the old "trough" plan attached to the lavatories, the fluid from both mingling together, and running through a long pucca drain into an open cess-pool outside the building. The contents are supposed to be removed by the conservancy carts twice every day, and carried to the distance of 1½ miles, but there is too much reason to believe that the quantity renders this impossible, and

that the fluid is frequently thrown on the ground.

112.—Not only were these urinaries highly offensive, but the cess-pool is within a foot of the open aqueduct that conveys the clean water to the reservoirs used by the soldiers in washing. The water tank, also, is close to the cess-pool, and the urine cannot be emptied out of the latter without its being passed over the aqueduct, so that there must constantly be some fouling of the water supply, either by the percolation from the cess-pool, or by accidental dropping when the latter is cleaned out, which it was ascertained by enquiry made on the spot, is only done once a day instead of twice, as ordered.

113.—A second kind of urinary was built in July 1861, on a new plan, and attached also to the lavatories, but the effluvium driven into the barracks was found so great, that they were closed before they had been a month in use.

114.—Since then, temporary urinaries have been constructed at the furthest corner of the lavatories. These had only been in use for two months at the time of my visit, and were so offensive that the men of the Artillery have been prohibited from entering them. The great defect consists in the want of ventilation, the absence of the proper vessels, and the great quantity of lime cement used, which has become horribly offensive from the action of the urine upon it. Instead of having the standard urinals, small earthen vases—resembling flower-pots—are placed in holes of the same shape, on a masonry platform coated with pucca plaster, and the result is, that the holes become filled with urine which cannot be cleaned out. A more defective plan it is difficult to conceive.

115.—The defects in each of the three kinds of urinaries noticed above might be at once remedied, by opening out the sides of the building, so as to have a thorough current of air passing through in every direction, removing all the pucca work and lime cement, laying down sand on the floor, and using one of the upright iron vessels before referred to as the Government standard pattern.

116.—A model urinary was at once commenced, at my request, and constructed in a few days at a cost of 45 Rupees. It is reported to answer the object exceedingly well, and to be free from all effluvium. The plan and specification is given in the appendix. (A.)

117.—Although the station of Umballa was built in 1843, 18 years ago, it is remarkable that no urinaries were constructed till 1861: up to that time, the only substitutes were open tubs placed in the verandahs of the barracks, where the men ate, slept, and passed their whole time. Even now, although the urinaries have been built, they are either wholly or in part condemned, because no urinals have been obtained. I can get no explanation why they are altogether wanting at Umballa, when found at all the other adjoining stations, and sanctioned by Government for general adoption.

118.—The expenditure of lime used by the sweepers at this cantonment is something enormous. By a return supplied me by the Executive Engineer for the past month, the cost was 81 Rupees, which is at the rate of 972 Rupees per annum. The quantity used in October—by one Regiment alone—was 156 Maunds,

or five maunds daily. This expense I have shown to be quite unnecessary, and that lime, in the way it is employed, is worse than useless.

119.—In the Artillery and Cavalry lines, the latrines are on the same defective plan as those already described. The men of the former Regiment are prohibited from entering the urinaries, on account of the bad effluvia which exists when these places are used, and which affects the whole barrack. At the hospital a cess-pool was found full of urine, which the sweeper confessed had not been cleaned out for 24 hours. The two casks belonging to the conservancy cart proved to be in a very defective state, the staves of one broken, and the funnels of both in pieces. It was quite evident, on examination, that they were not regularly used for the purpose intended.

120.—At the Cavalry hospital, the corners of the covered passage leading to the latrine were in many places stained, and the pucca plaster saturated with urine, showing that nuisances had been committed on the walls, for want of proper conveniences being provided. “Naunds,” *i. e.* shallow unglazed earthen vessels, were placed at intervals on the ground, but they were very inconvenient from being so low, and hence were not used by all. The plan of having partitions for every two seats in the latrines, instead of each being separately divided off, appears a very defective arrangement, totally neutralizing the object intended of securing privacy.

121.—It is stated by Dr. Brougham, in his Medical Report of the Regiment, that the outbreak of Cholera among the men of the 1st Bengal Fusileers, which occurred immediately after their reaching this station from Dugshai in 1857, was caused solely by the exhalations from decomposing faecal matter in these privies. The same result, also, was produced in the two succeeding Regiments which temporarily occupied the same barracks, viz. H. M's. 75th Regiment, and the 2nd Fusileers. All three corps had been located in the hills, they were in excellent health, and the circumstances in each case were so precisely similar, and the medical opinion recorded so strongly as to the cause, that we are forced to believe that a localized focus of the disease existed here at that time, in the way mentioned.

122.—At the Native Infantry hospital the latrine was in a most filthy state; it had not been cleaned out for weeks, and, on the ground in the rear, there was much ordure and refuse matter of every description, where it had been thrown by the sweepers.

123.—In the Sudder Bazaar there are two public places of resort, which are in daily and constant use. The buildings are composed of only sun-dried bricks, and the walls are coated with mud plaster, with a flooring of earth; not a particle of lime is used in any shape, either in the structure or as a disinfectant. There was no effluvia or ammoniacal odour perceptible in the one I inspected, although upwards of a hundred persons had availed themselves of the accommodation during the day, and it has been in use for the last 3½ years. The cost was only 365 Rs. I recommended a few improvements of a general nature, such as the admission of more light and air, the removal of the mat partitions,

and a fresh coating of plaster to the walls. These have been since carried out by the Cantonment Magistrate. The Lessee pays to Government from 500 to 800 Rupees for the contract yearly, and he reimburses himself by charging each person using the place a few cowries. From 300 to 400 persons of both sexes visit these latrines every day; they answer the purpose excellently, and are much valued.

124.—The Commissariat slaughter-house was inspected late in the evening, at the time the animals were being killed and the carcasses cleaned. All appeared in fair order, but the effluvium, as we approached the spot, was very great. No animals ought to be allowed to be killed in the Sadder Bazaar. The overpowering smell, and consequent accumulation of flies and dogs, are alone sufficient to prove the necessity of the prohibition, while it would prevent the sheep being driven across ground on which they pick up filth of every kind, both human and animal.

DELHIE.

125.—I visited the European Infantry barracks occupied by Her Majesty's 82nd Regiment on the 24th of November. Half the corps is located in the Palace Barracks at Delhie, or inside the fort, the other is placed outside near the Cashmere gate. None of the buildings occupied by the Regiment were originally used or intended as barracks, but have been extemporized as such, from the urgent necessity that existed in 1857 for quickly housing the garrison.

126.—It is proposed to erect 16 new barracks within the city, on the Palace site or its vicinity, but, at the present rate of progress, these cannot be completed under several years, the assignment being only one lac of rupees per annum. The plan of the buildings appears to be well designed, with the exception of the cook-houses, which are to be under ground, so as to be capable of being flushed by water from the canal. Such a system is likely to prove very objectionable in a sanitary point of view.

127.—Enormous heaps of bricks and stone—the debris from dismantled buildings—lie around the site where the troops are at present quartered, in every direction, and not only impede the current of air to a great degree, but give cover for accumulation of dirt, carcasses of dead animals, and other deposits of filth.

128.—The "Dewan Am" barrack has 21 windows, of which all except nine were shut at the time I made my inspection. (7 A. M.) The men were absent on parade, and the sweepers were engaged in cleaning out the building. Seventeen cases of Cholera, and eight deaths, had occurred in this barrack. Some bags of charcoal were hanging up, but they were much too few in number, were suspended at too great a height, and not changed sufficiently often: they were not brought into use until after the disease had broken out. The floor is washed once a week, and the walls whitewashed once during the year; for the future, this will be done every six months, according to a recent order on the subject.

129.—The Guard-room, a small building occupied by 2 prisoners, 1 Sergeant, and 6 Pri-

Guard room and cells. vates, has two ventilators in the roof, but no windows. These men are much exposed to the sun when going to and from the latrine, which is 90 yards distant. From the solitary cells, also, the prisoners have to be marched a very long distance, three or four times a day, for the same purpose. Both the latrine and urinary were highly offensive.

130.—The North gate of the “Dewan Am” square has been built up, so as to form a married soldier’s quarters. A drain runs under the apartment, and, from the great fall in the ground, it is clear that during the rains a large body of water must be collected here; at the mouth of the drain, I observed a great deal of cook-house refuse matter. A man, his wife, and two children occupy these quarters, which consist of a single room much filled with furniture, possessing no roof ventilation, but having two small windows. The family stated that the stench which came from the drain thus passing under the floor of their one apartment, and in which they pass both the day and night, was very sickening.

131.—The best barrack in the fort is the Motee Mahal, or X house, accommodating three Companies; a long line of buildings, the roof of which is much lower in some parts than others. In one of these low-roofed portions, the soldiers complained of a disagreeable smell under their sleeping cots, and, on the ground being taken up, it was found that a large drain or aqueduct existed, which had become filled with stagnant water and sludge that had found its way in from the canal. In neither of these two low, dark, and confined divisions were there any ventilators in the roof, and the current of air, which might have passed from one side to the other, was totally stopped by the verandah being occupied by a Sergeant who kept the door shut. Two or three cases of cholera occurred amongst the men occupying this spot, viz. the south end-room of X 3. The men still complain of the smell proceeding from the ground occasionally.

132.—In another spot, at the opposite extremity of the building designated V house, a similar offensive smell was complained of, and on the stone flooring being removed, a quantity of bones, dead rats, and filth was found at a little depth below the surface. It is remarkable, not only that several cases of cholera occurred among men sleeping here in 1861, but that at the previous epidemic of 1858, the disease should have found its victims on this very particular spot, the Regiment also having been changed.

133.—The Z house barracks overlook the river, and, at times, the exhalations from the bed of stagnant mud at the side is said to be very bad. The custom of throwing dead bodies into the stream above the soldiers’ quarters has now been forbidden. This building proved to be very unhealthy during the period of the cholera.

134.—The hospital is situated by the side of the canal which is dry during the hot weather, a bed of soft offensive mud being left after the water is exhausted. The latrine was found to be fearfully offensive; and the practice I

witnessed of keeping the excreta of patients till a late hour of the morning in the hospital verandah, where men—waiting the Surgeon's arrival to be examined—have to eat their breakfast, is much to be condemned. Other arrangements should certainly be made. It is worthy of notice in this place, that the *first* case of cholera in the Regiment occurred in the hospital, and was followed by several others of which alone seven proved fatal. The same occurrence also happened in the Artillery.

135.—At the married quarters the latrine was found to be in a most filthy and disgusting condition, fecal matter having been allowed to accumulate for weeks and months, without ever having been removed, showing how defective has been the supervision by the Pioneers, who are supposed to be responsible for the proper conservancy of these buildings.

136.—In the Executive Engineer's report, I find it stated that "the fluid from all the urinaries but one runs into the city drains, that the liquid refuse from the single men's privies is collected in a covered cess-pool, and that the two latrines at the married men's barracks have neither drain, nor cess-pools, nor vessels, but that the liquid flows over the floor!"

137.—In the barracks outside the palace, and near the Cashmere gate, there were much fewer attacks of cholera. This may, however, be accounted for on other grounds than that of locality. The hospital returns showed that the head quarters and one wing located *here* came to Delhie some time after the other wing, which had suffered much from venereal disease after their arrival, and were therefore more predisposed to attack.

138.—In the long range of barracks formerly known as "the College," there is the same interruption in the general height of roof, and deficiency of ventilation, noticed previously. In one of these compartments four cases of cholera occurred, of which three proved fatal. Underneath the building there is a series of low dark apartments, which had been blocked up, as the men kept dogs and other animals in them. In front of these, and under the verandah, the wash-houses have been constructed, so that the air beneath the barrack is necessarily always damp and confined. I recommended openings to be made at once, so as to admit both air and light.

139.—In the married quarters, near the coffee shop, the wall was very damp on one side, where the floor of the room is about 5 feet below the level of the ground. The rain also pours in at the window during a heavy shower, and remains several inches on the floor. The central room, therefore, is no longer occupied as a sleeping apartment, but is used only during the day.

140.—At the barracks of the Artillery all conservancy arrangements were on a much worse footing. There were not only no urinaries, but no carts for the removal of refuse matter; the result was, that the latrines were found to be in a much more filthy state. The construction, also, was sadly defective; the bench part being made of stone, and placed at too great a height from the ground, was not used as a

seat at all, added to which, the urine flowed over the floor in front instead of the rear wall. The stench here was most overpowering, and it was difficult to breathe inside the building, from the pungent ammoniacal odour that prevailed.

141.—At the cook-house the cess-pool was emptied only once in two days, instead of
Cook-house. every morning and evening, as is the rule elsewhere.

142.—The latrine used by the women belonging to No. 1 (Tile barrack) was very offen-
sive, the whole mass of brickwork having become saturated with
Latrine. urine, and the heaps of lime that had been thrown in by the sweepers only aggravated the mischief.

143.—The hospital is of good size and lofty, but it is situated at much too great a dis-
tance from the barrack, and has no roof ventilation; there were six
Hospital. small openings in the walls very high up, but these were covered over by sheets of finely perforated zinc, so that no free current of air could pass through. The privy was excessively dirty, and the effluvium sickening to a degree, while at the rear of the building a urine cess-pool is in existence, which was in a more disgusting state of filth than I have seen anywhere. The fluid had soaked into the wall of the hospital to the height of 10 or 12 feet, while, from the aperture of the drain extending down into the cess-pool, there was a great accumulation of fecal matter which had oozed out of the latrine. The appearance showed that this had existed for some time, and that no attempt had been made lately to remove it, or to cleanse the filth off the wall.

144.—The Native hospital is a large mosque with several domed apartments, lofty, but hav-
ing no roof ventilation. There are a few windows in the side which
Native hospital. require to be much increased in number.

145.—A great many sick occupied the building; 87 out of a total strength of 737, or
more than 10 per cent. Of these a portion belonged to the late 4th
Conservancy arrangements. Regiment Native Infantry, which had been under canvass during the last four months. The mortality was not great, but cases of spleen, fever, diarrhœa and dysentery very numerous. The latrine is an open one, i. e. having four high walls but no roof. It was comparatively free from all smell, and is simply cleaned out several times a day, no lime or charcoal being ever used.

146.—The 13th Regiment Bengal Cavalry was quartered at the Serai on the road to
the Eedgah. There are no buildings, save the four walls of the en-
Native Cavalry. sure and a temporary hospital; neither latrines or urinaries, drains, or any conservancy arrangements. There is much broken ground on all sides, where the Natives throw filth and refuse of every kind, and the effluvium was constantly complained of both by night and day, especially during the rains. The men suffered less from cholera than any other Regiment quartered at Delhie, by being rapidly moved out of the focus of danger, as soon as the epidemic commenced.

147.—In the city, the canal passes through several of the streets, and the water is much

The City and Canal. drunk by the inhabitants, as the wells are generally bad and their contents brackish. A simple and efficacious plan for purifying the water might be easily and economically adopted by constructing a reservoir at the spot where it enters the town, and filling it with sand, charcoal, and gravel.

148.—Having submitted the general outlines of an improved system of conservancy, which has been approved by His Excellency the Commander in Chief, An improved system suggested. it became necessary to take into consideration how the plan could be effectually carried out at this and other stations, without difficulty as regards establishment or expense.

149.—The Committee appointed for this purpose by the Officer commanding the station, have submitted a very full and valuable report, showing how the Committee's report showing how it may be adopted, and with an actual saving resulting. improved system may be worked with *an actual saving*, as far as the Troops are concerned, and a mere nominal excess required for the Bazaar, of 17 Rupees per mensem, which may be easily met from the grazing fund. The principal portion of the Report I have given in the appendix, (D) as the question is constantly being raised of a greatly increased establishment being required to carry out any improvement in our present system of military conservancy; and the practical solution to the problem is here worked out ready to hand, by a Military Committee who visited every spot of one of the most sanitariously defective stations in India.

MEEAN MEER.

Meean Meer. 150.—The Cantonment was inspected between the 4th and 15th of December.

151.—It is very gratifying to be able to report that the one great sanitary evil, which has been the standing reproach of this station for so many years, viz. The deep cess-pools now abolished. the deep cess-pools in the European Infantry lines no longer exist. Excavated to a depth of 60 odd feet, which is considerably below the water level of the country, and containing the accumulated *excreta* of every Regiment that has been located in the lines since the cantonment was formed, (some ten years back) these *Cloacæ maximæ* remained in the very heart of the station, giving out a perpetual and never ceasing effluvium, that during the hot weather was almost pestilential; and there is too much reason to believe that their proximity to the wells has, at some periods, affected the drinking water.

152.—The following history of these cess-pools is published by Dr. Chevers in the Indian Annals of Medical Science; and it illustrates the extreme difficulty and delay that occurs in altering any system that is in force, however bad it may be. In 1860, the Punjab Government obtained a Committee to report upon these cess-pools, and also to compare the method of conservancy in cantonments with that of the jails in this Province. The report is given in the appendix (B). It shows that the Committee was unanimous in recommending the prison system, which has been approved of since by His Excellency the Commander in Chief, and the highest Medical authority, but it has not yet been adopted at a single station. I believe that this can only be done effectually and promptly by

deputing an Officer to visit each cantonment and put the plan in operation.

153.—Dr. Mackinnon, Inspector General of Hospitals, states,—“I unhesitatingly give my

Opinions recorded by Drs.
Mackinnon, Green, Gordon,
and Chevers.

verdict for the surface privies, as being the most appropriate for British troops. They can be always kept sweet, whereas cess-pool privies, in such numbers as are required for a European Regiment, would certainly taint the neighbouring wells, and pure water is as necessary to health as wholesome food.”

“The standard design for a privy sanctioned by the Government of India, 30th September 1858, has the very serious fault of having a cess-pool connected with it; not—it is true—for the reception of the excreta, but to hold the cleansing of the back drain which is flushed from a small cistern at one end.”

“Several privies standing above large well cess-pools are in use at the European lines, Meean Meer. In March 1859, Dr. Green, the Superintending Surgeon, thus describes them:—‘The cess-pool privies erected in the midst of the barracks, and at no great distance from the wells, are huge nuisances. They were very costly in their erection, so much so as to have attracted the attention of the Home Government from whom enquiries were sent out as to their suitability for the purpose, and as to the necessity of such a large outlay. Great sickness occurred to the 51st Queen’s, in close vicinity to one of these cess-pool privies, in February and March 1859. They are, in fact, nothing more than huge cess-pools, placed, in defiance of all sanitary rules, in the very midst of the dwellings of the soldiers.’”

“It is remarkable that, as far back as 1853-54, Dr. Gordon of H. M’s. 10th Foot then occupying these barracks, reported that the system of drainage followed there of depositing excreta in cess-pools was calculated, in the course of a few years, to induce epidemics of cholera and fever.”

“We have already seen what frightful ravages, epidemic cholera in 1856, and again in 1861, committed in these very barracks, occupied first by H. M’s. 81st, and latterly by the 51st and 94th Regiments.

“The above concurrent remarks of the highest authority unquestionably demonstrate the absolute and indispensable necessity for the abandonment of all privy and urinary drains and cess-pools, and of the introduction of a thorough dry system of conservancy, all excreta being removed in carts and buckets to a distance of at least $\frac{1}{4}$ of a mile from the barracks and hospitals, and being there poured into trenches and duly buried.” [Dr. N. Chevers, “*Indian Annals*,” Vol. XII, Page 767.]

154.—Although the deep privy cess-pools have been filled up with lime and earth after

Urine cess-pools still in
existence.

removing the contents, yet the smaller ones for urine still continue in some parts. They are most objectionable. At the Native artillery hospital latrine, a drain leads outside into a closed cess-pool nominally holding urine only, but fecal matter is washed down by the same outlet, and remains permanently in the ground. This was witnessed by those Officers who accompanied me in my inspection; Colonel Bouchier, at my request, at once ordered the drain to be filled up, and pans placed inside the building.

155.—Near the hospital there is a large collection of Native huts—or Coolie lines—
 Artillery lines. in much too close propinquity, while heaps of filth and refuse matter
 are lying in this direction, not buried as it should be.

156.—Many of the covers to the seats in the European hospital latrine are broken ; the
 Defects noticed. floor of the hospital itself is washed only once a week ; the fire-places
 are in the verandahs and not in the central compartment, so that in
 the winter the sick do not derive any benefit from the fires ; and the men complain of the bad
 light in the evening. It appears that there were good solar lamps provided, but the Medical
 Officer (Dr. Harper) objected to their use, as the walls to which they are affixed became black-
 ened. They are still in store unused.

157.—One barrack (No. 1 Foot Artillery or the Napier barrack) differs in construction
 from all the other barracks at the station. It is very large and lofty,
 Peculiar circumstances con- with an enclosed verandah on four sides, and proved in a remarka-
 nected with one barrack of ble manner to be much healthier than any other barrack on each
 a different construction from occasion of epidemic cholera appearing at Meean Meer. During the last year, when the disease
 the others. was at its height, this barrack was occupied by Captain Raper's Company, and no cases occurred
 till some time afterwards, and then but very few as compared with what happened in the other
 barrack.

158.—In the married men's barrack there was no water in the wash-house, and none had
 Deficiency of water in been available for some weeks, owing to the brass taps not acting.
 wash-house. There are no separate latrines for the women, and no arrangements
 for the children.

159.—In the privy of No. 1 Artillery barrack, the stool-pans are worn out and highly
 offensive ; new ones have been applied for, but there are none in store.
 Delay in supplying articles of barrack furniture. There seems to be much delay caused by the present system of work-
 ing through three different departments, viz. the Engineer, Commissariat, and Barrack Master.

160.—Messing. Every private pays 2 annas per diem for extra food and wood, as well
 as 2 annas a month towards the stock of crockery. A mess caterer
 Messing system in the Ar- is appointed, so that variety is secured in the meal every day. Each
 tillery. man has a delf bowl and plate, and jugs are used for tea and beer, &c. ; the meat is also placed
 on dishes. Pork is prohibited. A great comfort has been provided through the efforts of Colonel
 Bouchier in the shape of screens provided to every door in the barrack, at a very small cost ;
 they have lasted 3 years, and effectually keep out all flies, dust, and glare. I think they should
 be supplied to every Regiment.

161.—In the hospital of H. M's. 94th Regiment urinals are much required ; at present,
 the urine flows into a cess-pool which has never been cleaned out,
 Infantry hospital. and the drain appears choked. In the latrine upright pans are used,
 but the Medical Officer prefers those of the shallow shape, as kept much more easily clean.

162.—Married barracks (European lines). The latrine at these barracks have been only

recently built. They were very clean and free from smell, having plenty of ventilation above, both in the roof and by means of large openings on three sides of the building. Have been constructed on the model of the jail surface privies, except that pukka work is used, and the seats are close to the wall, with a great deal of lime cement and brick masonry. The Quarter Master of the Regiment states, most unhesitatingly, that they are the best and cleanest in the lines ; but a low seat is required for children, who at present use the floor. Fifty men of the adjoining barrack also resort to this latrine, although not intended for their accommodation ; this is the best proof of the superiority of the plan.

163.—The Cook-house cess-pools or open reservoirs are $4\frac{1}{2}$ feet deep ; they should be reduced to 3 feet, and have a concave instead of flat surface at the bottom, for the greater convenience of emptying the contents.

164.—The latrine in the hospital of the 27th Native Infantry is in a very bad state ; it requires sand on the floor and total closure of the drain. At present there is an open filthy drain and “Naund,” within 20 feet of the cook-house ! No filth cart is allowed for this Regiment, nor does any come to remove refuse matter. There is a public latrine in the lines, but it is not used by the camp-followers who have to pay each 6 cowries ; the men of the Regiment are not charged. The six public latrines at Meean Meer are leased to contractors for 1,300 Rupees yearly ; this system of payment is, I think, a wrong one.

165.—The contiguous empty lines ought to be demolished, as causing at present much filth to be deposited : in the Regimental Bazaar, also, there was much excreta and filth in the unoccupied houses.

166.—The latrine of the Native Dépôt hospital was very offensive ; there are no pans, but every thing is passed on the brick floor, and the drain runs out into the open air. No filth-cart is allowed. During the cholera attack in August and September, which was so fearfully destructive among the European troops, not a single case occurred in the Dépôt consisting of 120 men. They do not resort to latrines.

167.—A Lock-hospital was established here on the 20th May 1859. Although worked at a very small expenditure, viz. 21 Rupees per mensem, it has been of marked value in diminishing venereal disease among the troops at this station, for the last 3 years. The returns show the following result :—

In 1858 the admissions were 26.8 per cent. to strength.

1859	„	23.3	„	„
1860	„	18.9	„	„

168.—The Establishment, which consist of a	Dresser	at 5 Rupees	} Total 21 Rupees.
Its Establishment.	Cook	„ 4 „	
	Bheestie	„ 4 „	
	Sweeper	„ 4 „	
	Female do.	„ 4 „	
[Native Doctor from Dépôt hospital,]			

should be increased by a Matron on 9 Rs.; and the Medical Officer, who supervises and takes an active interest in the hospital, should receive a staff salary of 50 Rupees. This would make the whole monthly expenditure only 80 Rupees, which could be easily defrayed by the local cantonment funds. The saving to Government in the increased health and diminished invaliding among the Europeans would be incalculable.

169.—The present building requires several minor improvements to increase its efficient working. It should be moved to the Sudder bazaar, enclosed with Improvements suggested. a high surrounding wall, and all the doors supplied with proper fastenings. A well and latrine are both required to be within the enclosure, and a Matron should be appointed to reside on the spot.

170.—In the Sudder bazaar, additional drainage is urgently required to carry off the water which lodges after rain, from the side streets into the main The Sudder bazaar. channel. In one quarter, a great accumulation of dirt, and pits full of stagnant water attracted particular attention. In the Gwalla Mundee, where the buffaloes which supply milk to the greater portion of the inhabitants are kept, there was ample evidence to show that the animals were systematically fed upon horse-dung, mixed with chopped straw. The butter purchased by the soldiers is nearly all obtained from this milk, which is frequently tainted in smell by the loathsome food they are supplied with.

171.—In the vicinity of the Commissariat slaughter house, there were heaps of bones and portions of dead carcases, which the Commissariat Officer promised should be buried in trenches under his own supervision. Sheep were feeding over all this ground, on which there was much animal filth and other refuse matter.

172.—The barracks and hospital in the Fort of Lahore were inspected on December 16th.

173.—One large latrine for the use of Natives was specially noticed, as being constructed on very bad principles. It was unnecessarily large and therefore difficult to be kept clean, and a drain exists on all four sides through which Conservancy very defective. water runs; but the sides of the drain were filthy beyond description, the stream only trickling along the bottom. The whole mixture of solid and fluid excreta passes on through a conduit of no less than 368 feet in length, and then escapes on to the open ground. Nothing can be worse.

174.—The latrine for Europeans, adjoining, was very offensive, and on an equally Latrine. faulty system; nor were there any urinals.

175.—A deep underground cess-pool, containing both faecal and urinous matter from the infantry privy, was found to measure only 18 yards from the well A deep cess-pool in the Fort. which supplies the bulk of the drinking water!

176.—Reverting to the original principle of a pure water supply being essential to health, and that in certain diseases, of which cholera is one, an intimate connexion may be traced between impurity of the water and the illness State of the wells at Meean Meer. subsequently appearing as the result, it will be right to record here what was the state of the

water at Meean Meer, both before and after the recent improvements were carried out.

177.—In the European Infantry lines there were four deep privy cess-pools containing

The number of deep cess-pools previous to the outbreak of cholera.

the accumulated excreta for many years, as well as ten other cess-pools containing urine mixed with water from the lavatories. In the

Artillery lines there are only urine cess-pools, although some of these contain faecal matter, as I have before shown.

178.—The distance of these cess-pool privies from the wells used for drinking water is,

Depth of the privy cess-pools, and their distance from the wells.

on an average, 700 feet; their depth varies from 58 to 63 feet, which is considerably below the constant waterline of the country, (37 feet)

and the contents, when opened, were found to be perfectly fluid for 15 feet at the bottom.

179.—The depth of the urine and wash house cess-pools is 37 feet; their distance from

Depth and distance of the urine cess-pools.

the wells varies, in one case it is only 118 feet.

180.—Dr. Browne, the Chemical Examiner at the Lahore College, commenced his analysis

Analysis of the water before and after the closure of the cess-pools.

of the well water on the 5th of September last, during the time that cholera was rife, and continued it at intervals until the 8th of April,

at which period the cess-pools had been emptied and filled up, and the new system of having *all* refuse matter removed by carts introduced. The result of his examination may be briefly stated as follows :—

A. The water from the wells in the European lines contained a larger quantity of solid matter than any others, (with two exceptions, viz. the Artillery cook-house and that of the Medical College) either at Meean Meer, Anarkullee, the Central Jail, or Government house : 58 wells were examined in all.

B. Of this solid matter, the salt found to be so remarkably in excess, and which formed nearly one half of the aggregate, was carbonate of soda.

C. There was, also, a large amount of organic matter, both in solution and suspension.

D. The water in all the wells at Meean Meer was found to be impregnated with sulphuretted Hydrogen when the wells were not in use; but there was this very striking difference observable, that, whereas, when the wells in the Artillery lines were worked the sulphuretted hydrogen ceased to be manifest, in the wells of the Infantry lines it continued even after the water had been kept in continual motion, by means of the Persian wheel, for several days and nights in succession.

E. This poisonous gas was found in greater excess in four wells, which were near the deep cess-pool privies, than in any others. There was, also, a very disagreeable smell in the water, and a dirty white scum floated on the surface.

F. After the cess-pools had been emptied and filled up, this sulphuretted hydrogen entirely ceased to exist in the water, although, previous to that event, all means adopted had failed to eradicate it.

G. Out of 12 *unused* wells examined in different parts of Anarkullee, only one was found to contain a trace of the gas.

H. In the Central jail containing 2,200 prisoners, (who are necessarily confined within

a very much smaller area than the barracks for the same number of troops located at Meer Meer occupy) not a trace of sulphuretted hydrogen, or any disagreeable smell, could be detected in the well water. But, the salts of soda were found to exist.

181.—This circumstance, taken in consideration with the proximity of the sites, and the

Conclusion drawn from these facts. exact similarity of soil, leads us irresistibly to the conclusion that while the carbonate of soda is derivable from the ground, (and it is equally found to exist in the deep wells of London and elsewhere) the sulphuretted hydrogen and organic matter originated solely from contamination with faecal matter from the cess-pools.

182.—I can see no other way in which its presence can be accounted for, and the Chemical

Corroborative opinion of the Chemical Examiner. cal Examiner records the same opinion in his report, as follows :—

“From the large amount of organic matter both in solution and suspension in these wells, and of the sulphuretted hydrogen, together with the proximity of the cess-pools to the wells, I believe there can be little doubt that the water had been contaminated by the cess-pools.”

183.—The qualities of the water in the four wells, to which particular reference has

Detailed analysis of the four wells nearest the cess-pool. been made, are thus described in the same report :—

Description and site of well.	Action produced on lead paper.	Action on solution of lead in soda.	Amount of sulphuretted hydrogen in a gallon of water.	Remarks.
Infantry lines, between No. 2 and No. 8 barrack.	Blackened.	Deep red colour.	$\frac{58}{100}$	Numerous whitish flocculi, and very disagreeable smell.
In front of No. 3 Barrack.	Slightly browned.	Abundant black precipitate.	$\frac{58}{100}$	Disagreeable smell, both in the water and air around.
Between No. 4 and No. 6 Barrack.	Somewhat blackened.	Red colouring produced.	$\frac{34}{100}$	White flocculi, very disagreeable smell, and many dead insects.
Behind No. 2 Barrack.	Blackened.	Deep red colour.	$\frac{66}{100}$	White scum on the surface, and very disagreeable smell.

“I would call attention to the fact, that the organic matter is in larger proportion in the two wells which contain sulphuretted hydrogen, viz. those marked No. 3 and 4 in the Abstract, than in the rest. The well No. 3 contained more in suspension, No. 4 more in solution. These two wells were both in the neighbourhood of cess-pools, and the sulphuretted hydrogen contained in them, was not removed by working the wells as it was in the others. That this may be a localising cause of cholera is evident; thus, in the report of the General Board of Health for 1850, it is stated that the inhabitants of 30 houses in Hope street, Salford, used the water of a well into which a sewer leaked, and that 26 people in those houses were attacked with cholera, and 25 died; while no case of cholera occurred among the inhabitants of 60 other

houses who did not use that well. Certain of the wells in the Artillery lines showed evidences of the presence of sulphuretted hydrogen as long as they remained unused, but became perfectly free from that substance as soon as they were worked. This would appear to be owing to putrefaction of organic matter in stagnant water, which is prevented by the constantly bringing up a fresh supply."

184.—The practical lesson to be learnt from a careful consideration of the above facts is, that it would be a most wise precaution to boil and filter all the drinking water used by the troops at this station. Admitting that the sulphuretted hydrogen has been got rid of by the closure of the cess-pools, still the soil adjacent will remain more or less saturated with animal matter, and which, carried down by the process of infiltration and percolation during the rains, must certainly find its way into the wells for some time to come. The large quantity of solid and organic matter are direct evidences of impurity in the water, and the alkaline qualities produced by the existence of so large a proportion of carbonate of soda, cannot fail but to affect the digestive organs, when taken into the stomach for so prolonged a period.

185.—The following extract from a recent number of the "Indian Annals of Medical Science," may have some weight in assisting our judgment. The name of Dr. Chevers is an ample guarantee for the authority on which it is quoted :—

"It has been fully ascertained by the French Medical Commission that rain-water is a prophylactic of cholera, and that this disease has *never proved an epidemic* where rain-water is extensively used. Galvestone in Texas is cited as affording the strongest possible evidence of the truth of this statement."

SEALKOTE.

186.—This cantonment was inspected on the 21st and 22nd December last. The barracks are generally spoken of as the best in the Punjab, and may be considered, in their completeness and style of building, as superior to those of Meean Meer or Rawul Pindee.

187.—The latrines and urinaries are all constructed on one plan, with the exception of two temporary unsightly buildings where the permanent ones have not yet been built. The defect in the latrines is want of ventilation, which, however, can easily be supplied by removing the honey-comb work of the present apertures. There are upright iron pans of the standard pattern let into wooden frames, but, though arched openings were made in the rear wall for their removal, they have been closed up in some of the buildings. The Inspector General of H. M's. Hospitals had previously ordered them to be re-opened ; this had not been done at the time of my visit.

188.—The children's latrine attached to the school-room was in a very filthy condition, from sheer neglect in not clearing away refuse matter ; up to 4½ P. M. the conservancy cart had not made its appearance. The seats are composed of masonry, and no pans are supplied ; both great evils.

189.—The urinals are made of planks of wood, in the form of a V shaped trough slanting towards one end, and covered with sheets of lead ; several circular apertures, however, are made in addition, through which the urine drops below into a pucca drain, thus re-duplicating the evil. This has been lately corrected in one or two, but still the principle is defective, from the troughs being placed close against the wall, and from the brickwork forming the supports becoming saturated with fluid, which makes the whole very offensive. The urine now flows through masonry drains into open reservoirs ; it used to mix with the refuse water from the wash-houses, and pass into underground cess-pools some 30 feet deep, but this has been recently put a stop to.

190.—The Commissariat slaughter-house is an excellent building, resembling a bungalow ; it has a pucca floor, as well a masonry trough for the blood, and the whole has been built at the Contractor's own expense. The defective points are, that the blood flows into a drain and thence on to the open ground, instead of being buried : so also with bones, dung, and other refuse matter, which were lying about round the slaughter-house, while a dirty ditch, in which there was much stagnant water and filth, passed along the rear. The cattle—both bullocks and sheep—are kept here ; all this ought to be remedied without delay.

191.—The hospitals are complained of as being very cold during the winter season ; the fire-places are in the verandahs, and do not afford any warmth to the inner compartment, but the men get up and sit round the fire during the day. Wire baskets filled with charcoal are fastened high up at the roof in each of the barracks, instead of being suspended low down, and they have not been changed since they were first put up some two years ago ! This is the case in all the lines, and in the hospitals, also.

192.—The urinary in the Artillery hospital privy was very offensive, from the sheets of lead nailed to the wooden trough having become loose ; and much dropping and soaking through in consequence, occurred beneath.

193.—One of the deep cess-pools receiving water from the wash-house lately burst, and is now under repair. These have been in use since the station was built, and two only have been emptied in the space of seven years ; at times the smell is complained of as being very offensive. Their depth is 25 feet, and the distance from the wells used for drinking-water varies from 150 to 480 feet. Although there are reservoirs for receiving the refuse fluid from the cook-houses, which is nominally said to be carried away in barrels, it is stated in the Engineer's report that a great portion overflows and soaks into the ground, or escapes into the kutchra drains.

194.—In the latrine of the Cavalry hospital several pans were deficient, and a disgusting nuisance is consequently committed on the floors. No one had reported that the pans were defective. Dr. Franklyn, at my request, had them counted over, and ten were found to be broken, and one removed to the Native hospital. The Steward was considered to have been the person who ought to have reported this, but he pleaded sickness for the last two months. The head sweeper, who receives 6 Rupees a

month for supervision only, was dismissed, for allowing the broken pans to be kept in a dirty state behind the latrine.

195.—An excellent reading-room, with easy chairs, fire, &c., is attached to the hospital, and these reading-rooms are also at each end of the barracks. They are much appreciated by the soldiers. There were good lamps, (American) trimmed by the men themselves, burning brightly in the evening, and every thing looked comfortable. Gardens are in front of all the barracks, protected from injury by a neat hedge.

196.—The cook-houses require alteration in the drainage, the refuse water being all thrown out at the entrance door-ways, instead of at the end of the building.

197.—Washing-rooms are much required in the married barracks, as the women cannot resort to the plunge-baths. I suggested the adoption of the two end rooms at present used for keeping water in, for the women, and the store-room in the verandah leading to the latrine to be similarly used by the men. The Engineer says this could be easily effected. A long bath should also be built, and a few basins supplied.

198.—The flues of the fire-places in the married barrack smoked very much; this might, I think, be remedied without much difficulty.

199.—There are 24 sweepers allowed to the Cavalry Regiment, but the Quarter-Master neglect of the sweepers. Sergeant stated that they only appear for an hour or two in the morning or evening, and are absent all day in the bazar.

200.—The lamps were very bad in all the barracks, Artillery, Cavalry, and Infantry, and the men are forced to purchase their own lights in many cases.

201.—The drain running down from the well used near the horse lines was complained of as being offensive; it requires being cleaned out or fresh earth thrown in, but it must be always liable to injury by the grass-cutters crossing it repeatedly.

202.—In the Sudder bazaar there are two public latrines erected by the contractor at his own expense. The one I visited was in a very filthy condition; the construction was correct and on a proper plan, but there was gross neglect in removing the refuse matter. An offensive drain of stagnant water and urine appeared in the centre, without any escape being provided: I recommended a small reservoir to be made, and the contents to be emptied into a cask placed on a cart, as is done in the lines. The contractor charges 5 cowries to each person using the place, but he pays nothing to Government.

203.—The Commissariat bakery was a low, dark building, sadly deficient in light and ventilation, with a very offensive drain and filthy reservoir outside. The contents are never removed, except by throwing them occasionally on the road, the fetid black mud being heaped up on the sides by the sweepers. The stench was very bad.

MURREE.

204.—The hospital and lines of this Sanatorium were inspected on
 Murree.
 the 27th of December.

205.—Cholera appeared here in a very severe form, in July 1858, but it was confined
 almost entirely to the Europeans in the depôt. The disease proved
 Cholera in 1858.
 rapidly fatal in the course of a few hours, and out of 42 admissions
 33 deaths occurred. The strength of the depôt was 250. The first case, also, took place in
 hospital. No officers or any of the families resident in the station were affected.

206.—The principal number of cases were admitted from one barrack, (No. 4) in which
 the flooring was discovered to be more or less decayed underneath. A
 Suspected cause.
 quantity of shavings and chips of wood in a rotten state was found to
 be mixed with the earth on which the boards and rafters rested. This great defect was after-
 wards rectified, and charcoal and sand thrown in to the depth of 10 inches. The roof of the
 verandah, also, leaked very much, and added to the dampness of the floors, which could scarcely
 ever have been dry, as they were frequently washed down, and the water beneath had no
 escape.

207.—But, in addition to these internal evils, a tank containing stagnant and offensive
 water was in close proximity to the barrack, while a collection of
 Other sanitary evils.
 Native huts, and a wall surrounding the whole, effectually checked
 free ventilation. The parade-ground was always muddy or under water, and saturated debris
 of wood used in the buildings existed to a great degree, on every side.

208.—The floors of the other barracks have been recently examined by a Military com-
 mittee, and all found to be resting directly on the earth, and to be
 The flooring rotten.
 more or less in a decayed state. One of the planks taken up in my
 presence showed this very completely; the rafter also on which it rested was rotten, and fungi
 adhered to the surface of the wood. The flooring cannot be dried when washed down for the
 purpose of cleanliness, and the only remedy is to do what has been proposed by the committee,
 viz. to take up the boards, dig out a space of 2 feet, and then re-lay the flooring. The committee
 sent in their report on the 31st October 1861, but only two rooms have been done in No. 5, and
 one room in No. 3 barrack.

209.—A remarkably parallel case of cholera arising from precisely the same cause, occur-
 red in the British camp before Sebastapol, and is placed officially on
 A parallel case quoted in
 illustration.
 record. The flooring of some wooden huts occupied by the 79th
 Highlanders was found to be rotten, and a collection of damp earth and mud remained beneath.
 Each set of men, from H. M.'s 79th, 31st, and Royal Artillery Regiments, who successively occu-
 pied these huts, (in every case an interval of time elapsing in which the huts were left empty)
 were attacked by the disease, which ceased as soon as they were removed from the buildings.
 Full details will be found in the Report of the sanitary Commission (Page 109).

210.—The Medical Officer reports that the barracks are over-crowded, and suggests that

Barracks are over-crowded. no more than the prescribed number, viz 300, be located here. In 1861, as many as 400 were quartered in the depôt at one time. During the last autumn, a camp was formed at the "flats," about 3 miles off, and 50 men—relieved every week—kept out in tents, with very good results.

211.—One barrack (No. 5) having an upper storey was occupied, at the time of my inspection, by two Companies of the 4th Sikh Regiment, who use it during the winter, as their own lines are too much exposed to the weather. The floors and bath-rooms were very dirty, the latrine most offensive, and the pans and wooden seats in an excessively filthy state, from being improperly made use of. Ordure, moreover, was thrown down on the ground in the rear by the sweepers, instead of being removed according to rule: none of these men were present, and did not appear until half an hour had elapsed after they had been summoned.

212.—The difficulty of efficiently cleansing the floor and walls after the Sikhs leave the building, shows that this arrangement is a defective one, and disease is very likely to appear subsequently in this barrack amongst the Europeans.

213.—The latrines of the hospital and barraeks are all on one plan, having deep iron cylindrical pans in portable wooden frames. The windows are not kept open, as they might be, with much advantage in lessening the effluvium. In one corner of the latrine was a common earthen vessel used as a urinal, the iron urinals having become defective; and, though the requisition for them had been sent to Rawul-Pindee some time ago, it had not yet been complied with. A spare supply of these, as well as of the iron stool pans, should be always kept in store on the spot, to prevent the delay and inconvenience now experienced.

RAWUL PINDEE.

214.—On December 29th I inspected the public latrines near the city. Of these three are Rawul Pindee; public latrines. pucca and four kutcha built, the dimensions being 70 feet x 40 each; the former cost 900 Rupees in constructing. No charge is made to the public, as at other stations.

215.—They are more or less in a filthy state, owing to there being only one sweeper attached; the urine, also, lodges in large quantities at the rear, and their offensive state. there is no method by which this nuisance is attempted to be rectified. The kutcha drain all round is very foul and offensive, and the ground immediately outside, as well as inside the area, is improperly dirtied with excreta. In the immediate vicinity of one enclosure, there is a natural excavation or deep hollow in the ground, which was much resorted to in preference to the latrine.

216.—Thirty sweepers, including one Head man and a cart, are maintained as a fixed Establishment, at a cost of 140 Rupees monthly, paid for out of the choongee fund. The filth is carried half a mile off, but left unburied.

217.—On December 30th I visited the right and left European Infantry lines, occupied

European infantry lines. by H. M's. 98th and 51st Regiments.

218.—The central hall built in each of the new barracks as a reading-room is not used for that purpose, but is converted into a kind of store-room for boxes and tools, and there are neither tables or lights. The original plan of the building ought to be adhered to.

219.—Five of the Infantry and two of the Artillery barracks are floored with only Kutchra floors. kutchra or sun-dried bricks; a very bad arrangement, as causing constant dust and dirt inside.

220.—The hospital accommodation is very deficient and confined, there being only one Hospitals insufficient. building for the Artillery and both the Infantry Regiments.

221.—The public latrine in the regimental bazaar appears as if it was never allowed to be used: the wooden door ought certainly to be removed, it was fastened at the time of my inspection, so that no one could enter. The sweepers all live on this spot, and hence do not like the place to be visited; they may be found here themselves during the day, but this ought to be prohibited, as the distance from the lines is much too great.

222.—The filth pits for receiving the refuse from the lines are too far distant to allow of the carts making more than two trips per diem. They are left open, and the effluvium is very bad. It is proposed to establish the pit for the right barracks at nearly double the distance (5,300 feet), building a pucca bridge across the ravine, and making a road at an estimated cost of 500 Rupees. I visited the site selected, and on pointing out the objections, the Executive Engineer agreed to the trenches being dug at a nearer spot.

223.—In the Native Cavalry lines a deep drain runs at the back, which is complained of as being very offensive in the hot weather, having numerous pits of stagnant water with very sinuous and broken banks. This might easily be remedied by a straight channel from bridge to bridge, and filling up any portion which is unnecessarily wide or deep.

224.—No filth cart is allowed. The rear of the lines is very dirty, and faecal matter appears in every direction. There are 3 sweepers to each troop; these however are paid by the men, not by Government. The horse manure is sold for 30 Rupees per mensem, but the contractor will not remove either the sweepings of the lines or the contents of latrines.

225.—The cleanest and—at the same time—most used place of public resort was a piece of ground near the ravine, beyond the Sudder bazaar, marked off simply by four mud walls. Here a very large number of the inhabitants resort. Sweepers come afterwards, and cover over the refuse matter; but there were numerous pigs on the ground, which should be prevented. No smell, or fluid lying stagnant, was anywhere perceptible; the ground absorbing the one, the open air carrying off the other. The plan appears to answer much better than the costly pucca latrines, which are not used by a title of

the number who come here. I recommended the trial of a similar plan for adoption outside the city. The one great advantage of this system is, that the site can be frequently changed if necessary.

ATTOCK.

226.—I visited the Fort, garrisoned at present by a detachment of H. M's. 98th Regiment, on the 22nd of January.

227.—The hospital has much of the free current of air obstructed in front, by the latrine and wash-house having been run up to a great height, and exactly in the centre of the building. These should be removed, and rebuilt on the bastion at the extreme corner, where a small building—not used—already exists, which would answer the purpose very well for the latrine and urinary. There is an open space contiguous, on which the wash-house could be erected. At the back of the hospital, a parapet wall running the whole length, also obstructs air in a great degree.

228.—The wells inside the garrison are dirty, and contain much solid organic matter from not being used; but all the drinking water is taken from a well on the outside, and during the rainy season the river water is drunk.

229.—There are four quarter-galleries or latrines, constructed so as to hang over the walls of the fort. The refuse drops below to a great depth, and hence there is no bad effluvium, but the wooden seats (an open bench without any partitions) were soiled, and are evidently much neglected by the sweepers.

230.—The other latrines, six in number, are badly constructed and very offensive, there being no escape for the urine except on to the open ground; no pans, little or no ventilation, and every thing passed on the floor. Wooden tubs are used as urinals.

231.—The reading-room is an uncomfortable, cheerless, and dirty apartment, with a mud floor, very dusty, and without light or tables; it is also unsuited to the purpose, as it adjoins the Canteen so closely that reading is out of the question.

PESHAWUR.

232.—The inspection of the several lines in this large cantonment occupied my time from the 3rd to the 9th of January.

233.—The extensive jheel or swamp, which is considered to affect the health of the troops located at Peshawur by its malarious exhalations, has formed the subject of much consideration on the part of the local authorities; and, in the course of last year, several thousand trees were planted between it and the station, so that a belt of forest might in time be established, as a kind of protection against the miasma from that quarter. The level nature of the surrounding country renders its being drained impracticable.

234.—Moreover, as fever is prevalent throughout the whole of the Peshawur valley, it

Fever. would appear that the unhealthiness of the cantonment does not entirely depend upon any local cause.

235.—Few wells exist in Peshawur, owing to the great depth it is found necessary to sink them, and hence the inhabitants obtain their drinking water from tanks, which are supplied by the stream which runs in every direction both through the city and cantonments.

236.—But, these tanks, instead of being lined with masonry, are mere excavations in the ground and of very limited dimensions, so that the water rests upon a bed of soft mud, in which living and decomposing vegetable matter, animalculæ, and other foreign bodies, exist to a very large amount, and must necessarily render the water unwholesome.

237.—There is great reason to believe, from the data furnished on the subject, that much of the sickness at Peshawur is caused by drinking this water, and it would be most desirable that arrangements could be made for having it both boiled and filtered for the use of the European troops, throughout the year.

238.—The facts recently recorded by Mr. Bettington, illustrating the poisonous effects of decaying vegetable matter in wells and tanks, caused by the rotting leaves from the trees which overshadow them, are fully confirmed by the Medical Board at Bombay, who quote instances of fever, and bowel complaint being produced from this cause, and in which the disease was immediately stopped when the water supply was changed.

239.—There is much improvement required in the conservancy of the station and city, owing to the dense mass of the native population, and their proverbial inattention to personal cleanliness. One of the most urgent reforms required is that of levelling the ground, and filling up all hollows or pits where stagnant water is found to exist.

240.—I noticed numerous places in which this great sanitary evil occurred, in the neighbourhood of the streams and tanks, where the water had either overflowed or had been dammed up for building or some other purpose, and had become putrid and offensive. The attention of both the Civil and Military Authorities should be earnestly called to this point, as, from the numerous rivulets which exist, the danger is liable to occur at any time, (being either accidentally or artificially produced) and, hence, constant supervision of every spot is required.

241.—Another great defect in the conservancy, is the accumulation of filth which is to be found in any unused piece of ground, or which, from its broken and uneven surface, affords the convenience for committing a nuisance. All such places ought to be visited daily by some active and trustworthy official, who should be held responsible for any neglect.

242.—The danger from the sources described above is much greater at Peshawur than in

The danger peculiar to any other station, owing to the large population both in the city and Peshawur. cantonment, the vast quantity of water which passes in every direction, and the certainty not only of its absorbing any filth and impurities it may meet with in its course, but of itself becoming injurious if allowed to overflow or stagnate in any spot.

243.—The benefits of the station hospital might, with great advantage, be much increased by converting one ward into a Lock-hospital worked on an efficient Lock-hospital required. system. The prevalence of venereal disease is very great, and a large proportion of the troops at this station are suffering from its effects. I annex a valuable letter (E) on the subject from Dr. Ross, the Medical Officer of H. M's. 21st Hussars, who organized a similar system of examination at Meean Meer.

244.—In the Artillery lines the following points require notice :—

Artillery lines. Defects. A. The latrine of the quarter guard has no pans or wooden seats, and defæcation, &c., is performed on the ground ; the base of the wall is much damaged from the absorption of urine ;

B. In No. 9 Foot Artillery barrack the floor is of common earth ;

C. The chimneys in the married quarters smoke very badly ;

D. In No. 2 barrack there is no ventilation in the roof of the verandah where the married men sleep ; either openings should at once be made, or they should be directed to occupy the inner apartment during the night, as it has free roof ventilation and double the cubic space ;

E. The men have no flannel cholera belts served out to them as part of their kit, although it is granted in the Royal Artillery and Infantry.

245.—In No. 3. and 4 barrack occupied by Capt. Newhall's battery, there are no wash-houses, except at each end of the verandah, and these are given up to the use of the women. The men, therefore, perform their ablutions in a tent with a flooring supplied of loose bricks.

246.—The ventilation in all the pucca latrines at this station is very deficient, but it might easily be corrected by opening out the present arches, and enlarging them 2 feet in a downward direction. This, the Executive Engineer stated, can be done, without injuring the building in any way, at the trifling cost of five Rupees for each latrine. It would very much improve these places, as the effluvium is at present most injurious. The wooden seats and brick work are broken, as well as saturated with urine and soiled with faecal matter, showing that the sweepers are very negligent in their duty ; the iron pans, also, are not placed properly in position, and heaps of lime moistened with urine—and fearfully offensive—appeared in every direction. The whole system requires correcting by increased Regimental supervision.

247.—In no part of this cantonment are there separate urinaries, but these are being built in the rear of the wash-houses, and will very soon be completed. Urinaries. Urinals, however, of the standard pattern, are supplied to most of the Regiments.

248.—In No. 1 Foot Artillery barrack, occupied at present by H. M's. 93rd Regiment,

Chimneys. the chimneys smoke very much, and the atmosphere of the whole building was suffocating. The men do not wash in tents as in the Artillery, but they make use of the end-rooms attached to the barrack ; the women washing in their own private quarters.

249.—In one latrine used partly by the 93rd Regiment and partly by the Royal Artillery, (half being allotted to each) the floor on both sides was in a most disgusting state, filth being deposited in every direction. I could obtain no information as to whether the sweepers were to blame, or who was held responsible for the prevention of such an unusual nuisance ; some of the patent urinals were also found to be improperly used by the sweepers as receptacles for filth during the day, so that they became needlessly offensive and soiled, when placed in the verandahs or washing-rooms for use at night.

250.—None of the sweepers are put in charge of any particular latrine and barrack, which seems to be much required, so that responsibility and punishment can be at once definitely awarded in case of neglect. Major Hastings, commanding the Royal Artillery, stated that the filth cart came to his lines only once a day. The men have *no* urinals at all, and they urinate through the wooden seats of the latrine, a most objectionable and filthy practice. All these I found to be very offensive.

251.—In barracks No. 9 and 10, the latrine is a kutchia built one ; there are no pans, and defecation is performed on the ground. For the married women and children there is a small mud building adjoining, much out of repair, and the seats have given way and are dangerous to make use of.

252.—2nd Bengal Cavalry. These lines were very filthy, great accumulations of human refuse matter being found at the rear of the huts. The excuse offered was, that there are no sweepers or carts allowed by Government, and that the men have to make their own arrangements by paying themselves for the work, which is necessarily very imperfectly done. There are 12 sweepers (with 12 donkeys) entertained by the Regiment ; and in addition, several persons from the city remove the horse litter for the sake of manure, but they will not remove human filth, or ashes, rags, bones, &c., which consequently litter the ground in every direction, and increase rapidly in quantity daily.

253.—A better system is urgently required, and I think that the use of a filth cart, and an Establishment of sweepers should be allowed, just as much as to a Native Infantry Regiment. In fact, common sense would fail to discover how the difference first came to be made. It is of little use one Regiment keeping its own lines clean, if an adjacent corps has poisonous effluvia both of animal and vegetable decomposing matter always arising from the spot. A public latrine exists, but is not used by the men.

254.—4th Regiment Bengal Native Infantry. The cess-pool attached to the wash-house was full of most putrid water. There was also an open privy, or enclosed space of ground in the rear, very filthy from accumulation of excreta.

255.—In the Sudder bazaar there are two public latrines ; both of them are kuteha built and open at the top. I found a large accumulation of filth and sweepings outside, and the Establishment was fined by the cantonment Magistrate for neglect in not removing it. Several of these heaps existed in different parts in the vicinity of the bazaar.

256.—The Establishment consist of 1 head sweeper, @ 5	Rs. 5 0 0
16 sweepers, @ 4	Rs. 64 0 0
1 cart, @ 15	Rs. 15 0 0
and there is, at present, an extra cart, @ 15	Rs. 15 0 0
<hr/>	
Total Rupees, 99	0 0

All are paid for out of the bazaar and chowkeedaree funds. The details appear amply sufficient, if there was proper supervision constantly kept up over the men. Without this, it is hopeless to expect any thing, but inefficiency. But in addition to the above, several of the Native residents in the bazaar pay private sweepers for removing refuse matter from their houses.

257.—The cantonment Magistrate only supervises the Sudder Bazaar. Formerly, he had charge of the whole of the conservancy arrangements of cantonments, which now are put under the barrack department. The plan does not answer, owing to the divided responsibility, which is attempted to be shifted from the sweepers to the drivers of the carts, or vice versa. This should be at once remedied. Each Regiment, as well as the Sudder bazaar, should have its own conservancy Establishment, both for collecting and removing refuse matter, under its own supervision, and no excuse should then be either offered or accepted if proper cleanliness in every part be not rigidly enforced.

258.—A defective arrangement, also, is that of allowing the public latrines to be paid for by those who use them. The sweeper in charge makes a demand of 10 cowries—or a quarter of a pice—for every one who resorts there, but he pays nothing himself to Government or to the bazaar fund, the sole agreement being that he should keep the latrine clean ; and this, certainly, is not done at present, while the charge is double what it is elsewhere. The sweeper confessed, in the presence of the cantonment Magistrate, that all the filth then in the latrine (4½ P. M.) would remain there, together with subsequent additions, until the following morning. This is decidedly bad ; unless these places are kept perfectly clean, or at least constantly empty, we are only generating the disease we wish to escape.

259.—The Kotwal of the bazaar admitted that, although he had been in his present appointment 3 years, he had never visited the site where the refuse from the bazaar was carried to, and that he did not even know the exact spot where it was deposited. This place was, therefore, next inspected. It is close to the cantonment boundary, within 50 yards of the watch-tower at the central point of the bazaar, and here all the accumulated sweepings and filth of last year were found deposited, in an enormous quantity.

260.—Adjoining this spot is a garden belonging to a zemindar, who, on being called for, stated that the ordure is thrown on his ground contrary to his wish, but that the sweepers do not mind his repeated prohibition. He complained that the crops were injured by the manure being much too acrid when fresh, and added that no one would buy it in its present state, but that, if thrown first into trenches and allowed to decompose, he would be very glad to purchase it.

261.—In the bazaar itself the drains are more or less out of repair, caused in a great degree by their being allowed to be banked up in places where building operations or other work may have required a collection of water to be made. At the spot where the soojie is prepared for the bread eaten by the troops, the drain was very defective, and the smell from the stagnant water most offensive.

262.—The slaughter-house, where sheep and goats (50 per diem on an average) are killed, in the centre of the bazaar and in the very middle of a row of dwelling-houses, was the worst place I had yet visited. The horrible accumulation of blood, garbage, entrails, and the filth proceeding from them, was perfectly revolting to the sight, and sickening to the smell. I can scarcely conceive what this place must be in the hot season, but I no longer wonder at hearing that there has been much sickness and mortality in the bazaar. No sheep ought to be killed or kept in any street, or where dwelling-houses exist.

263.—The cows are slaughtered in a spot more on the outside of the bazaar, yet still much too close to the shops and houses. It was very filthy also, but, being more open and of larger dimensions, the effluvium was not so bad as at the other slaughter-house. There are three of these in all, one for sheep and goats, the other two for cows and buffaloes.

264.—The running water in many parts of the bazaar only flows down one side of the street or road; this ought to be corrected, each channel being used in turn alternately.

265.—The lines of the European Infantry, occupied by the 93rd Regiment, were inspected on the 6th of January. In No. 9 barrack, the seats of the latrine are out of repair, the brick-work gone, and iron pans deficient or broken; all very offensive, and showing that the sweepers were not made to do their work properly. The pans are not put close under the seats, and, hence, all the nuisance arose from want of common care. The excuse offered was, that 6 sweepers (out of 30 allowed) were employed in digging the pits used for burying the filth. This is not a sufficiently valid plea, as 24 sweepers, in addition to those employed at the hospital, are found to be ample by other Regiments, and the men need not be sent to the pits except from 12 to 2 P. M., as is done by the 7th Regiment.

266.—No. 10 and No. 13 barrack latrines were equally filthy, and the seats also broken. The upper archways in the walls ought to be enlarged to admit of greater ventilation. The handles of the iron pans require to be al-

tered, as they project above the level of the rim, and prevent the pan fitting properly under the seat.

267.—The wash-houses at the corner of each barrack are too dark, and hence are not kept clean: wooden gratings for the men to stand on are much needed.

268.—Hospital purdahs have been supplied some time, but for want of nails are not put up! No filth cart had arrived at the time of my visit (9½ A. M.).

269.—Six of the barracks have very bad floors, the material used being small pieces of brick, little better than the common earth.

270.—A tank for drinking-water is most urgently required. The supply is at present kept in an open pit with kutcha sides and bottom, so that the water is always resting on mud. In the lines of the 21st Hussars, as well as of the 11th Native Cavalry, pucca tanks have been built. Why not for the two Regiments of European Infantry? Two small tanks, 8 feet square and covered over, (as in use at the Rawul Pindee jail, with a fixed filtering box for the water to pass through) would be much better than one large one, as it would allow of perfect cleaning out when required. The horses of the Artillery get water from a well.

271.—The reservoirs for wash-house water are no less than 13 feet deep, at six of the barracks; many of them are kutcha, *i. e.* not lined with masonry. There being no means of removing the contents, either drains should be cut, or the sweepers told to sprinkle the water on any dusty spot round the barracks, as is done in all our jails. At many stations, this water is allowed to run into the soldiers' gardens; by attempting to carry it away the filth cart is improperly used, as the latrines do not get cleaned out so often as they should be.

272.—An excellent soldiers' garden has been made, on one side of which a Gymnasium is to be erected; both occupations are much liked by the men.

273.—There is, also, a very good regimental reading-room, nicely lighted up, and the floor covered with matting. It is managed by the Regimental Chaplain. There are 444 subscribers; subscriptions vary from 2 annas to 8 annas monthly, according to rank: an occasional gift comes from an Officer, or help from the canteen fund. American lamps are used with the best oil.

274.—8th Regiment Bengal Native Infantry. In the public latrine belonging to the Regiment great reform is needed; the passage was filthy to such a degree by being improperly made use of, that no one could pass down it to enter any of the partitions. The sweeper's excuse was that he did not attempt to clean it out until the cart arrived; it was then 10 A. M. and no cart had come. An immense accumulation of refuse matter, immediately outside, had been evidently lying there for several days. Openings are required to be made in each partition, so as to allow of fluid escaping, and this should be collected in a small reservoir at the end, by means of a drain running the whole length outside.

275.—The water used for drinking purposes is taken out of a tank, the mouth of which

Tanks, why used. remains closed for a very long time. It would be better to let the aperture remain open, so as to prevent the possibility of decomposing vegetable matter and leaves injuring the water. The present plan is adopted by the Natives, to allow of the earthy particles brought down in the running stream (which supplies the tanks) subsiding; and they also find the water to be much cooler than when taken from the stream direct.

276.—The ventilation for the whole of the lines is almost entirely prevented by the row of cook-houses built in front, which completely shut out the air from the huts in which the men live. The cess-pool outside the hospital of the 8th Native Infantry is 15 feet deep, and contained 12 feet of stagnant water with 3 feet of offensive mud below.

277.—An order is required to have the conservancy cart made over to the Regimental authorities; and to be under *their* supervision. At present, while under the barrack department, there is no means of securing its attendance twice a day, as ordered.

278.—The Regiment has been six months at the station. The daily average number of sick is 50 out of 560 strength. Deaths in hospital were 16 during the year, beside some casualties occurring in the lines. The duties are very heavy.

279.—A very good latrine is attached to the hospital of the 1st Regiment Bengal Native Infantry.

280.—The lines of the Regimental doolie-bearers, situated near the fort, are in a very bad state; the whole enclosure is a complete swamp caused by the overflowing of the stream which passes through it, and enormous heaps of refuse of every kind—animal and vegetable matter mixed with human excreta—are rotting on each side near the wall. This might easily be rectified. There are also too many tanks; in some of them stagnant water existed. *Every one* of the inmates (400 in number) was ill during the last autumn with fever.

281.—Commissariat slaughter-house. Inside—a kutcha floor, no reservoir of water, and no pucca channels for collecting the blood; meat kept in a building in which the hides, both dry and fresh, are allowed to remain, and 10 or 12 Natives sleep here and cook their food; walls and ground very dirty, the latter saturated with blood. Outside—heaps of putrid matter, garbage, and excrement; the stench most sickening and intolerable; trenches are required to be dug at once for the daily reception and burial of this matter, which is quite sufficient to propagate any epidemic disease.

282.—The Fort barrack. Very cheerless and uncomfortable; a mud floor, insufficient light,—from lamps not having been supplied—and a long open drain running down at the back. In the open reservoir attached to the cook-house there was $2\frac{1}{2}$ feet of putrid water, for which there are no means of removal provided.

283.—The European latrines were excessively filthy; there are neither urinals or urina-

293.—There are standard urinals supplied, but the inner pans, being formed of native made earthen-ware, are nearly all broken, and have not been indented for by the Regiment. These are used only at night time, when they are placed in the corner rooms of the verandah.

Urinals.

294.—Wooden gratings are much needed for the wash-houses, which are very dark. Openings in the wall should be made to admit both light and air. Pucca reservoirs are also required for the refuse water, and a drain made to carry it off.

Wash-houses.

295.—The reading-room numbers 431 subscribers, and two hundred men visit the room every day, but there are not more than 40, on an average, in it at any one time. The lamps were excellent, and gave a brilliant light. There is no soldiers' garden here.

Reading-room.

296.—The hospital privy was very free from effluvia, quite as much so as that of the 21st Hussars, or any latrine I have yet visited. This was mainly due to the close supervision of the medical officer Dr. Moorehead.

Hospital latrine in excellent order.

NEWSHERA.

297.—This station was visited on the 9th of January, but the lines were unoccupied, so that no proper sanitary inspection could be effected.

Nowshera.

298.—The barracks are small, being built to accommodate only 25 men in each, but the plan and general arrangement is good, and they are very cool in the hot season. Perfect ventilation moreover is obtained, and, from the small number of men sleeping in one apartment, a great degree of privacy and comfort is secured.

New plan of barracks.

299.—Iron latrine pans have been supplied to all the barracks, but in the hospital earthen-ware ones are substituted.

Latrines.

CAMPBELLPOOR.

300.—I inspected the barracks and hospital on January 10th. They had been last occupied by the wing of the 93rd Highlanders, which left the station two months previously.

Campbellpoor.

301.—The buildings have been designed on nearly the same plan as those at Nowshera, and appear to be approved of by every authority who has visited them.

Barracks.

302.—There are no drains or cess-pools of any kind, except the small pucca reservoir at the hospital latrine, which is emptied daily. Pans have not been supplied to any of the barrack privies.

Absence of all drains and cess-pools.

DERA ISMAEL KHAN.

303.—This station was visited on the 15th of January.

Dera Ismael Khan.

304.—A small detachment of European Infantry occupies the old Native Infantry hospital in cantonments, which has been converted into a temporary barrack for them, and 30 men are quartered in the Fort, about $1\frac{1}{2}$ miles.

Barrack not built for Europeans.

distant.

305.—There was very defective supervision, as regards conservaney arrangements: noticable here. The urine cess-pool had not been cleaned out for days, and the contents were black and putrid; the seats of the latrine soiled, filthy, and improperly used.

306.—There were three sweepers including the hospital one, besides those in the fort, and in addition to this number, there is a conservaney establishment of 2 sweepers and 5 Bildars (with a cart) who are paid 50 Rupees monthly. The charge of 18 Rupees, every month, for feeding two bullocks, appears excessive.

307.—The guard-room has been formed temporarily out of two cells by removing the partition wall; it is complained of as being very cold during the winter.

308.—There were no lamps in the barraek, and the men used their own private ones. No requisition or indent has gone in for them.

309.—In the fort matters were still worse. The cart only goes once in three days to remove refuse matter, and the latrines are consequently very filthy. In the wash-house both water jars and basins were deficient, and the drain at the cook-house was choked up with dirt. There was no rope or string attached to the hospital windows, which could not, therefore, be opened when required from the inside.

MOOLTAN.

310.—I inspected the cantonment, city, and fort, between the 24th and 31st of January.

311.—Artillery. No conservaney cart is allowed for these lines, and the refuse matter is supposed to be removed three times a day by the sweepers. Could not the want be remedied by letting some of the gun bullocks be used, as is done at Dera Ismael Khan? At present, a great portion of what is said to be taken away is clearly thrown on the ground, in close vicinity to the buildings.

312.—The drain in front of the harness-room contained stagnant water, very offensive. Close by is a large covered cess-pool of great depth, which is cleaned out once in 8 months: the contents—water only—are most horribly fetid, caused by the quantity of gram and barley that is washed down into the cess-pool from the tank in which they soak. This might easily be prevented by having a small iron grating fixed inside the tank, while a great saving of grain would also be effected.

313.—In the hospital the ropes to the windows were all defective, and there was only one lantern, giving a very bad light. Two sweepers are allowed to the hospital, and eleven sweepers to the lines, consisting of only four barraeks with four latrines attached. But the men keep the horse lines clean also.

314.—The roof of the hospital latrine is very deficient in ventilation; openings are required in the walls, and pans much needed, several being defective.

There are no urinals of any kind, either here or in the whole cantonment.

315.—The plan of the wash-houses at Mooltan is a very good one, the best I have seen
Wash-houses. at any station, and well worthy of being imitated elsewhere.

316.—Married quarters. Three rooms are allowed to each family, but the end rooms
Married quarters. have no ventilation of any kind, neither by roof, chimney, or windows! This is a great and pressing evil, as the air must be stifling in the hot weather.

317.—There are chimneys and flues in the barrack, but the partition wall subdividing
Defects. the space into separate quarters destroys this advantage, and prevents a fire being lighted. The defect might easily be cured in one half of the apartments. At present, the soldiers with their wives and children sit round open braziers of lighted charcoal, which are dangerous to a degree, being easily knocked over, and there are quantities of articles in the room which would rapidly ignite.

318.—In the latrine of the married quarters the pans are deficient, and they are badly
Latrine. made, being much too small. The wooden seats or frame-work is also placed too high.

319.—In the one large Artillery barrack, built on a different plan from any other, the
Urinaries. urinary adjoins the store-room. There are no vessels of any kind, but the men urinate into two long drains, which are connected again by cross channels, (in all, 50 feet of open superficial draining); these lead into a cess-pool 15 feet deep, and from which the contents can never properly be removed or cleaned out. In the other urinaries the fluid passes on to the ground, there being neither urinals or reservoir provided.

320.—All the barracks of the Artillery, except the large one noted above, are described
Barracks designated as temporary. as only temporary.

321.—The 101st Regiment Quarter-guard; this building is very hot and much exposed
Lines of the 101st Regiment. to the sun; it measures 50 feet \times 18 \times 14. On the night previous to my visit, 17 men had slept in this room, so that each man had only 741 cubic feet of air instead of the prescribed *minimum* of 1000. Twelve persons should be the maximum number allowed at any time to occupy this building.

322.—The dry cell adjacent measures feet $29.10 \times 7.10 \times 16.2 = 3780$ cubic feet. Sergeant Milligan stated that he has known a man to be in this cell for
Punishment cells. 12 days, and that seven men have been confined there at one time, so that each man had only 540 cubic feet of air.

323.—Gardens do not exist. They were commenced, but ordered to be discontinued
Gardens. by request of the Executive Engineer, as being too near to the wells. Might not the large Cavalry garden close by, and at present unused and uncultivated, be devoted to this purpose?

324.—Hospital latrine. Consists of two buildings or ranges built back to back, with
Hospital. a double wall, and the passage between them is used by the sweepers; these walls sadly interfere with ventilation. No less than 10

pans were deficient out of 24.

325.—The model latrine and urinary had not been commenced up to the time of my visit, although the order (No. 3241) from the Chief Engineer had been issued on the 14th December.

Model latrine not built.

326.—Married quarters. There are 14 end-rooms in the barracks for 14 families; one of these was measured in my presence by the Assistant to the Executive Engineer, and proved to be only feet $17 \times 9.10 \times 17 = 2843$ cubic feet. In this room, private Burrage, with his wife and three children, lived during the day and night; the room was more or less crowded with furniture, viz. boxes, chests of drawers, and bed, which took up much of the space.

Married quarters.

327.—The Fort. At the Quarter-guard, a wooden stand and drain are required for the purposes of washing. The guard at present have only one *gumlah* or earthen basin for 17 soldiers to make use of, and this is obliged to be placed on the ground.

The Fort.

328.—No pans are in the latrine of the guard-house and no urinals; the men use the wooden seats, which are necessarily soiled and offensive.

Guard-house.

329.—The latrine for the women was clean and free from smell, but I expect it is not much used.

Latrine.

330.—Urinaries are urgently required; one near the wash-house, and one close to the barrack against the North East wall.

Urinaries required.

331.—In the new latrine that had only recently been constructed, there is *no* ventilation; arched openings should, at once, be made between every second beam, and the partition wall removed.

Ventilation.

332.—There is no Native latrine, but the guard resort to a domed building, the ground of which was covered with filth, there being no fittings or provision made of any kind.

Arrangements for Natives.

333.—An order was issued last year, desiring that the cess-pools should be *all* filled up, but this was done only in the European Infantry lines, so that those in the Artillery lines, and two in the fort near the cook-house, still remain. This evil ought not to be allowed to continue any longer.

Cess-pools not filled up.

334.—The latrine used by the guard at the East gate was most horribly offensive; it is partly below the ground, and is without any ventilation. It might be removed to the empty apartment above, which is not required for any purpose.

Latrine at Eastern gate.

335.—Sudder Bazaar. The Kotwal, a Parsee, has no written instructions or copy of the Darogah's Manual. Wooden stocks existed in the lock-up, where five men were confined. Both the Kotwal and the bazaar Sergeant admitted that it had been the custom to keep the prisoners in the stocks during night, up to within the last month, owing to the accommodation being considered insecure.

Sudder bazaar.

336.—In the "Cooks compound," a reservoir of very offensive and putrid water was

Cooks' compound. discovered, 4 feet deep, and only 9 feet from the well. The upper trap or wooden lid could not be opened except with great force, and appeared to have been nailed down. In the "Hindoo Mundee" a second reservoir also existed, equally bad. Eight sweepers only are allowed for the bazaar.

337.—Slaughter-house. The windows were tight shut, and a very offensive smell existed in the building where the meat was kept, the floor being only of earth, and saturated with the blood and drainings from the carcasses when hung up. Outside, there is no pucca trough to conduct the blood away, which is eaten by pigs when thrown out, instead of being buried. The Commissariat Officer stated that he would have the floor made pucca, and the windows opened, as also a pucca channel constructed, to rectify these defects. Charcoal ought to be supplied.

UMRITSUR.

Umritsur. 338.—This station was visited on the 10th and 11th of February last.

European Infantry lines. 339.—European Infantry lines. At the latrine of the old hospital there is not sufficient separation for men and women. The wooden seats, also, here—as in every other latrine in the station—are very low, and the shape in which they have been cut is a most inconvenient one. This ought to be rectified at once, and it can be done so without difficulty. There were no urinals or iron pans.

New hospital. 340.—At the new hospital, the cess-pool reservoirs were very dirty. In the cook-house no fire-places of any kind have been erected. No barrel cart for carrying away fluid comes, but the sweepers empty out the contents of the reservoirs on the ground or into the drains. At this latrine, there were three of the standard pattern glazed urinals standing against the wall not used, while a common open *navul* was half full of urine. The excuse offered was, that there was only one patient in hospital. Additional ventilation is urgently required, by means of arched openings, 3 feet \times 2; at least six of these should be made. The cess-pool of the wash-house had not been cleaned out.

Urinary and cess-pool. 341.—The barrack urinary forms part of the wash-house, or is attached to it. No urinals are provided, but a long masonry trough is made use of, which was very fetid and disgusting. The cess-pool is within 20 feet of the cook-house, and the stench arising from it was horrible. It is much too deep also; the sweepers having to make use of a ladder to get down to it. None of the three urine cess-pools had been cleaned out when the detachment left; all were examined, and found to be equally neglected and offensive.

Married barrack. 342.—Married barrack. The punkahs are perfectly useless, as the swing allowed is not 6 inches—owing to the iron roof above, and the partition walls below intervening. These walls are 8 feet high, so that no motion in the air is perceptible. Some better arrangement for pulling the punkahs in these quarters is urgently required. They were complained of by all.

343.—The latrine is a double one, and there is plenty of ventilation, owing to the roof

Latrine. having a high pitch, like one of the barracks.

344.—Fort Govindgurh. The artillery latrine should be built nearer to the barrack, as the men are much exposed in walking the great distance which exists between the two buildings. There are no pons, but only a pucea masonry seat with divisions ; the number of seats, also, is too many, needlessly increasing the nuisance by the long open drain in front. There are seven privies, but none for the Natives, who make an improper use of corners and ground concealed from view. No urinals are allowed in the fort. In each of these latrines the urine flows along an open drain, and down the sides of the fort wall, into the covered way below ; a most filthy practice.

345.—The charecoal baskets were tied up too high, close to the roof, and, by some extraordinary blunder, it is always *washed* at this station, which completely destroys its disinfectant powers !

346.—The lavatory arrangements are very defective ; the tables or stands being much too high, and appropriated for tailoring or other purposes, while the earthen basins are taken away, and used for the men's dogs.

347.—City. The Kotwalec lock-up requires a latrine to be built at the corner opposite to the wash-house, and an entrance made in the rear, to save the trouble of bringing the prisoners all the way round by the open streets.

348.—In the city there exist large ponds of stagnant water, some being of great extent, which must be regarded as more or less a source of much danger to the health of the inhabitants. They seem originally to have been formed by exeavations made when the town was built, so that from their low position they necessarily receive all the drainage and fluid refuse of the city.

349.—They are not only in the very heart of the town and in every part of it, but round the city there is a deep ditch, which—at some parts—swells out to the size of a perfect lake, and contains an enormous quantity of putrid water with vast traets of black stinking mud ; and from these hot-beds of malaria fetid exhalation goes on throughout the year, and mingles with the atmosphere which is breathed by thousands. At some future day, when an epidemic disease breaks out, the mortality in this city may be expected to exceed what has ever been witnessed elsewhere.

350.—I know not whether the magnitude of the evil, or the natural feeling of shrinking from a repulsive task, has hitherto allowed such a state of things to continue, but I confess that I have never in any spot witnessed greater sanitary defects concentrated together.

351.—In the back streets there are collections of both faecal and urinous matter, either wholly stagnant or slowly trickling into the large pools I have described, by the side of which fell-mongers are cleaning skins or washing the entrails of animals ; while blood and garbage from slaughter-houses, refuse fluid from dyers' shops, the sewerage from thousands of houses, the water in which tens of thousands of people have

washed their bodies, the acrid lye from cattle-stalls, and, in short, the drainage and liquid refuse of the whole city runs either into the ditch or these stagnant pools.

352.—Moreover, to increase the evil, and unnecessarily add to the poisonous atmosphere, the brick-kilns are erected close to the town gates, and here the whole Deposit of refuse matter. of the solid filth and excrementitious matter—both of men and animals—that has been removed from the city is thrown down, and lies seething and rotting under the fierce rays of a tropical sun, in order that it may be used in burning bricks.

353.—It may indeed be considered an Augean evil, but the task does not require a Hercules to undertake it. Some of the stagnant pools have already been filled up by the unaided efforts of the District Officer, Major Farrington. This should be done to all, and there would then appear fine open spaces which might serve for markets, and be at the same time the lungs of this great over-built city; shops also might be erected on the four sides, and trees planted (as is done in all the continental towns,) some permanent boundary being required to prevent future encroachment, which, from the great value of ground in the city, would be constantly attempted.

354.—But, the brick-kilns should be closed, the deposit of filth at the town gates, or, in fact, in any spot within half a mile of the town, should be peremptorily put a stop to; as, also, the carrying on certain trades, slaughtering animals, and other occupations which, as injurious to health, are rightly considered nuisances, and can be punished by law. Lastly, I would strongly urge the necessity of appointing a sanitary Officer, so that the work may be done thoroughly and efficiently, and of applying for the sanction of Government to the introduction of Act No. XIV of 1856, which, at present, is in force in the capitals of the three Presidencies.

355.—If experience has proved the necessity of enacting certain special laws for the preservation of the public health at Calcutta, Bombay, and Madras; if every city and town in England and on the continent has its fixed sanitary Acts, and organized system of conservancy; and if the small communities in the Himalayan sanatoria have their municipal commissioners, who are vested with powers to enforce the prevention of nuisances, what argument can be adduced to show that the same laws, the same system, and the same powers are not equally required in the great cities of the Punjab, where the population is densely congregated together, and where epidemic disease has occurred in past years of a fearfully severe and fatal nature? Is it prudent, is it humane, is it our duty to wait until the danger has occurred before we apply the remedy?

356.—Lest it may possibly be thought by some who read this statement, that the defective sanitary condition of the city of Umritsur is in any way exaggerated by my description, I would refer them to the District Officer, Major Farrington, who accompanied me through every part of the city, and pointed out the evils that have been existent so long, or to the report of the Superintending Engineer, Captain Hutchinson, who has devoted much time and trouble to the subject.

357.—But, if any one is able to make a personal examination, let him drive round the

Enumeration of the worst spots. city between the walls and the ditch, and then entering the town visit the following spots :

A. The place where the tanners and fell-mongers carry on their trade at the great pool of Sun Singh.

B. ' A pit or hollow, some 15 to 20 feet deep, near the above pool, into which nothing but urine and house drainage appears to run.

C. The collection of green stagnant water from the Huslee canal, where it passes into a small tank called Luchmun Sir.

D. The deposit of all the sweepings and solid filth of the city at the Khizanah gate.

358.—So deeply impressed was I myself by the magnitude of the danger, that I considered it my duty, before I quitted the station, to obtain not only the record of eye witnesses to the evils that existed, but the opinion of practical and professional men as to the best means of remedying them. I therefore invited the following gentlemen to form a sanitary committee :

E. A. Prinsep, Esqr., Commissioner.

Major Farrington, Deputy Commissioner.

Capt. McMahon, Assistant Commissioner.

Capt. Hutchinson, Superintending Engineer.

Dr. Maclean, Civil Surgeon.

W. Gordon, Esqr., Civil Engineer.

H. Cope, Esqr.

359.—On the 11th of February, the committee accompanied me to the city, and after making an inspection of the different spots I have referred to above, Report of Superintending Engineer. adjourned to the Commissioner's Cutcherry, and heard the report of the Superintending Engineer, which embraces the whole subject, and enters minutely into the details both of the evil and the cure.

360.—As regards the large pools of stagnant water in the city, the committee unanimously agreed that, judging from what had already been accomplished, it was not only quite feasible to fill them up, but that the work was urgently necessary, and ought to be commenced without delay. Necessity of filling up the pools without delay.

361.—With reference to the city ditch, three plans were brought under discussion, viz : The city ditch.

1st. The pumping out the fluid at certain points on to the fields, for manure, by means of powerful machinery.

2nd. Carrying off the contents by a deep drain leading into a nullah some miles distant.

3rd. Flushing the city drains, and filling the ditch with water to a depth of 8 feet, by means of a cut from the canal ; embankments on the sides at certain parts, and an outfall at one end, being first made.

362.—The conservancy establishment in the city of Umritsur, at present, consists of

Conservancy establishment. 111 bheesties and 362 sweepers, at a cost of 1,280 Rupees monthly, or Rupees 15,360 per annum. But the bheesties are useless or worse than useless, and I saw none of them in my passage through the town. It would be far better to hire donkeys with panniers formed of a pair of large *dubbās*, such as ghee or oil is kept in, and in this way carry off the fluid filth, having a small reservoir at the end of each street and lane in which it should be collected;—carts cannot pass through most parts of the city. Surface drainage and rain-water might, of course, flow into the ditch.

363.—The whole of the conservancy is now let out to one man, who declares that he pays 6,000 Rupees *per mensem* as the cost of his establishment alone; Work done by contract. but it is quite clear that the work is not done properly, and that a reform is loudly called for.*

JULLUNDER.

Jullunder. 364.—This cantonment was inspected by me on the 6th of March and four subsequent days.

365.—Artillery lines. The urinaries are constructed on a very objectionable plan, consisting of a deep pucca trough fixed against the wall of the building, which Artillery lines. has become more or less saturated with the moisture, and the surface of the bricks, both on the interior and exterior, is fast crumbling away. This damage had been previously repaired by a fresh facing of brick-work, but the injury is again very great. The effluvium was overpowering.

366.—Four iron tubs are sanctioned for each barrack or company, but these are all more or less injured and out of order; and, as the men are not compelled Urinals wanting. to use them, no requisition for their being repaired has been sent in to the Executive Engineer. It may be stated, in fact, that there are neither urinals or latrine pans in the whole station.

367.—The privies are long buildings with tiled roofs, and internally masonry *choolas*. Latrine. There are no wooden seats and pans, but defecation is performed on the ground, the refuse matter being raked out by the sweepers, a long distance, into pucca reservoirs. The whole arrangement is bad, and could not be worse, as proper cleanliness is impossible, and the ground becomes soiled to a great extent; all this might easily be rectified, by making use of the ordinary standard iron pan prescribed by Government, or earthen-ware *gunlahs*.

368.—The "married quarters" provide two rooms for each family, but there is a punkah Married quarters. in only *one* apartment, which pulls very slowly and has but little swing or play; it is almost useless. The wash-house has neither basins or stands, and the floor is without gratings to protect the feet from wet.

369.—The latrine requires more ventilation, which can be at once effected by making

* Since the preparation of my report, I have been informed officially that an officer has been specially appointed to carry out the necessary work for the correction of the existing evils.

Latrine for women. openings of 12 inches in diameter and 2 feet apart in three of the walls. It would be far better to let the women have a separate building; at present they use a double latrine common to both the barrack of the single men and themselves, but with a partition wall inside.

370.—These quarters have gardens attached, and the men work in them because they get the vegetables; but, in the one common garden belonging to the
Gardens. Regiment the soldiers will not labour, as the produce is all sold. Three coolies are allowed from the canteen fund.

371.—The model latrine and urinary have been erected, but neither were fitted up in-
Model latrine and urinary not completed. ternally with seats, pans, or urinals.

372.—The European Infantry barracks are in every respect on the same plan as those
European Infantry barracks. of the Artillery, except that the hospital which has been recently erected is an iron-framed building, well adapted for its purpose.

373.—Bugs swarm in these barracks, and were very much complained of by the soldiers; they are said to fall from the roof which is of thatch. Loss of sleep
Vermin. from this annoyance, and the practice of lying outside on the damp ground to avoid the vermin, which, here as at other stations, amount to a perfect pest, must tell upon the health of the men, especially in the rainy season.

374.—Each barrack appears to differ in some slight degree in the mode of ventilation
Ventilation. adopted; all is effected by the roof, but in some barracks it is much freer, and admitted through larger openings than in others.

375.—The latrines were very offensive, and constructed on so bad a system, that I ob-
Latrines. tained permission of the Officer commanding to have one altered, by making openings in the upper part of the wall for increased air, and supplying wooden seats with pans. The improvement effected, and the advantage of having all the other buildings so altered, is furnished in the report given in appendix (C.)

376.—The wash-houses and urinaries have been ordered to be pulled down, being much
Wash-houses, &c. out of repair; the model urinary will then be built for each barrack.

377.—The Sudder bazaar has a public latrine, which requires more light on one side.
Sudder bazaar. The Native Cavalry lines were very irregular and dirty in parts.

378.—The evil of underground cess-pools, which are in existence at this station, and the defective state of the urinaries, are so clearly and forcibly de-
Underground cess-pools. scribed by the Executive Engineer, in his letter No. 145, of the 10th September last, that I give the following extract verbatim,—

379.—“The cess-pools in the rear of each urinary are 14 feet deep and 10 feet in dia-
Engineer's report. meter, and have been in use since the year 1848. Two of them have been lately cleaned out; the process was offensive in the highest degree, and so dangerous did it appear to me, that I requested the Commanding Officer to permit the remainder to stay undisturbed, at least until December next. These cess-pools were found to be filled up to the top with the drainage from the wash-houses and urinaries, with a dense

black slime of 4 feet thick at the bottom, which was removed with great difficulty, and caused the adjacent barracks to be, in my opinion, dangerous to the health of the troops; the work, however, was carried on with the utmost possible vigor, and was completed with no bad effects. The fact is, that the cess-pools no longer permit of the liquid draining into the sand below, as they are so blocked up with the solid filth at the bottom that they may be considered nearly water-tight: thus the drainage from the wash-houses gives much annoyance and trouble, and new cess-pools of similar construction would produce similar results in time."

"The odour from the urinarics is most offensive; although quicklime is used, yet the bricks and floor become thoroughly rotten, and saturated with ammonia in a very few months. They should be lined and floored with slabs of slate."

KANGRA.

Kangra. 380.—This fort was visited on the 11th of March last.

381.—The "married quarters" and lower barracks are three excellent buildings recently erected, and standing on a small piece of table land below the fort.
Married quarters. The latrines were clean because, at present, not used, but they were unprovided with either pans or urinals.

382.—The latrine of No. 1 barrack is an old tower or bastion of the wall. All excreta are passed on the ground. Blocks of cut stone—with spaces between—are provided as seats, but no one will make use of them as intended, nor is stone at all adapted for such a purpose. Hence, the whole place inside is defiled. There is a double wash-house, but there were no stands either of wood or masonry for the basins.

383.—At No. 2 barrack, the latrine is a new one and very well constructed; portable vessels or pans for removal should however be supplied, or it will soon become offensive.
Latrine (No. 2 barrack.)

384.—Another barrack is being altered inside the fort by raising the roof, but the whole space is very much confined, and the men and officers have partly to occupy the same area.
Barrack in the fort.

385.—The open tank in the upper part of the fort requires the protection of a rail. It is very deep, and at present extremely dangerous by its being left open, and having to be crossed by all the men who occupy the flag-staff barrack.
Tank.

386.—A latrine is required to be built for the accommodation of the men quartered in the upper barrack inside the fort.
Latrine required.

DHURMSALLA.

387.—The convalescent Depot was inspected on the 12th of March.
Dhumsalla.

388.—The European hospital is very small; both this building and the barracks are unprovided with lightning conductors, which should be supplied at all hill stations.
Hospital.

389.—The latrines have stone seats, with intervening spaces,
 Latrines. but no pans or urinals.

390.—At the wash-house, stands for the basins, and wooden gratings for the men to
 Wash-house. stand on as a protection from the damp floor, are urgently needed.

391.—The cook-rooms ought to have fire-places supplied, and tables for cutting the
 Cook-rooms. meat upon. In their present state it would require no ordinary exertion to prepare any dish that a sick man could relish. The buildings are good, but internal fittings are totally deficient.

392.—A piece of ground is being levelled and cleared for the erection of a new barrack
 Site for new barracks. and hospital below the present site. Although it appears rather exposed to the force of storms, I believe that a more sheltered locality is not easily obtainable.

393.—The Native Infantry lines are being re-roofed at the expense of the Regiment ;
 Lines of Native Infantry. the cost has already amounted to a very large sum, but the buildings were before dangerous both to life and health.

394.—One or two pucca reservoirs for spring water are very much required, so that the
 Reservoirs required. men may be saved the necessity of drinking the melted snow water in the winter season, which is said to cause goitre among them. The expense would be very slight, and the benefit a great one.

JUTOGH.

395.—I visited the lines, occupied at present by a detachment of the 2nd Rifle Brigade,
 Jutogh. on the 21st of March.

396.—Although the barracks have not been built for European soldiers, the site is an
 Excellence of site. excellent one, and admirably adapted for a hill station for British troops, of whom 300 might be located here without difficulty. There appears to be plenty of water, and the advanced state of vegetation in the soldiers' gardens, where the men were busily working at the time of my visit, shows that the position, though an elevated one, is in parts well sheltered from the North.

397.—The principal barrack is the hospital of the late Nusseeree battalion, a fine building measuring 144 feet by 41, and 15 in height.

398.—Some alteration is required in the latrines, one being too near to the hospital,
 Latrines. while an additional one is needed for the use of the men occupying the two small barracks.

399.—A tank for the collection of a supply of water during the night is also a desideratum.

400.—The soldiers' gardens and reading-room are excellent models, and prove a great
 Gardens and reading room. resource to the men throughout the day.

SUBATHOO.

401.—The head quarters of the 2nd Battalion Rifle Brigade : these lines were inspected

Subathoo. Defective points, on the 24th of March. The defects that came under my observation, may be briefly noticed as follows :

1. There are neither urinals, latrine-pans, nor wooden gratings to the wash-houses.
2. The seats in the latrine are wrongly constructed ; the bar of wood in front being inconveniently broad, and causing a nuisance to be committed, as it cannot be properly used as a seat.
3. The garden is too far off to be valued, and the men are prohibited by the Surgeon from going there.
4. There is no separate building appropriated as married quarters, the only substitute being the end rooms in the corner of each barrack, so that proper privacy and comfort are impracticable.
5. The Quarter-guard is very confined, and deficient in ventilation.
6. The floors of the solitary cells require repairing.
7. The wash-houses, three only in number, are not sufficient for the Regiment, and the same remark applies to the urinaries.
8. Only one latrine is provided for the accommodation of three entire barracks, Nos. 8, 9 and 10.
9. Improved ventilation is required in the lower rooms of the new barracks.
10. Additional light should be provided, by supplying windows to the centre compartment of all the old barracks.
11. A new range of prison cells to be erected in a less objectionable locality than the present.
12. An additional amount of barrack room, to supply the place of the building that was destroyed by fire in November last.
13. Mules (one per company) furnished with suitable panniers are urgently required to convey refuse from the latrines to proper places of deposit. If these were allowed, one sweeper per company might be dispensed with.

402.—On the other hand, should be prominently noticed—the splendid hospital, complete in every point of construction and accommodation ; the spacious reading-room, well lighted, better fitted up, and more comfortable than any I have yet seen, (but the superiority is solely in the completeness and arrangements effected by the Regiment, not in the building itself) ; and lastly the soldiers' workshops well attended, and the work turned out of first rate quality.

DUGSHAI.

403.—I visited this station on March 25th. The lines at that time were empty, but have since been occupied by H. M.'s 42nd Regiment.

404.—The latrines are built on the same plan as those at Subathoo, and have the same defects. Both urinals and iron pans are required for every barrack.

405.—The barracks are all very dark, and it would be a great improvement to supply
Barracks. *dormer* windows in the roof, as has been lately done in the hospital.

406.—An ordinary single barrack has been converted into quarters for the married
Married quarters. soldiers, by means of wooden partitions run across. Two apartments
are provided for each family, but the entrance from one to the other
is most inconveniently narrow, being only 2 feet in width, so that all access, except for children,
is practically cut off.

407.—The fire-places are formed in the corridor, and each one, though very small, has
Fire-places. to accommodate four families.

408.—Urinals ought to be allowed in the hospital during the day, to prevent the uni-
Hospital. sance which is at present committed for want of them.

KUSSOWLEE.

409.—This station was established as a sanatorium in 1842. At the time of my visit
Kussowlee. (March 26th) it had not received the full number of convalescents
from the plains for the present season.

410.—There are three different kinds of latrines in use here.
Latrines. 1st. The old plan, having a stone trough attached for a urinary,
which was very offensive and used improperly, solid filth being deposited in it.

2nd. An enormously long building, containing no less than 52 different seats in a double
row of 26 on each side, with wooden partitions, and supplied with close stools or upright
iron pans. There is an open drain in front, which, as well as the wood work was saturated
with urine. The seats were broken, and pans offensive to a great degree. Neither urinals nor
urinaries exist.

3rd. The newest and best constructed had wooden partitions, but were without vessels
of any kind, and, hence the seats are constantly dirty and soiled. The urine, also, lodges ex-
tensively in the flooring.

411.—In the married hospital there are drains passing out from the bath-rooms, but
Drains. without any proper drain on the outside to carry off the water, which
soaks into the ground, or remains unabsorbed in large pools.

412.—At the slaughter-house, 76 sheep were confined in a small dirty out-house mea-
Slaughter-house. suring 18 feet \times 10 \times 6½ high! The atmosphere was so fetid as to
be unfit to be respired, and the floor was covered with dung that had
been accumulating for a long time. Two dead lambs—dropped during the night—were on the
ground; a sufficient proof of the overcrowded state of the animals.

413.—The Regimental bazaar has one public latrine, but it appears to be little used,
Bazaar. owing to the house of the sweeper in charge being placed in a very
objectionable position, so that every one resorting to the place is ob-
liged to pass the open door of the building occupied as a residence by this man and his family.

414.—There is a long tank or pool in the centre of the bazaar which should be kept cleaner than it is, otherwise it will be reported as a nuisance and dangerous to health.

PHILLOUR.

Philour. 415.—This station was visited on the 28th of March.

416.—There are no regular barracks at present constructed here for the detachment of Europeans who supply the garrison; a portion being located in the old Native Infantry hospital and Officers' bungalows, while the remainder occupy the magazine buildings in the fort.

417.—In consequence of the stench that prevailed in the latrines, I recommended that increased ventilation should be at once supplied, wooden seats and portable iron vessels provided, all lime got rid of and its use abolished. I, also, pointed out the great want of a latrine in the fort for the married families, of proper urinaries for the men, and the necessity for cleaning out the well.

418.—I have the satisfaction of stating that all my suggestions for improvement in the general conservancy of the lines and fort were promptly carried out, under the orders of Colonel M. Smith, C. B., commanding at Jullunder. The whole was effected within 14 days after my report had been submitted to him, and the expense has been very trifling.

419.—The committee ordered to examine into the working of the dry system, state that the bad effluvium of the latrines was at once removed on the new plan being commenced.

FEROZEPOOR.

Ferozepoor. 420.—I visited this cantonment on April 11th, 12th, and 13th.

421.—The Native Infantry lines—occupied by the Goorkha Regiment—were all clean. The hospital is an old Native Infantry building, very spacious and in good condition, but the latrine attached was dark and offensive for want of ventilation. Both upper and lower apertures are required, with a drain leading behind into a small pucca reservoir, so as to prevent the water ponding inside.

422.—This Regiment suffered very severely from small-pox in 1860, and again from cholera in 1861. The habits of the men, as regards personal cleanliness, however, are much improved since that period, through the exertions of the Medical Officer, Dr. Jas. Browne.

423.—The Artillery Lines are at present unoccupied, the men being located in the Infantry quarters. One of the Barracks is very low and confined; it used to hold 100 men, but, for the future, not more than 30 or 40 will be put into it. There are no wash-houses.

424.—The two other barracks are much better, and have a pent roof with plenty of space. These were formerly used as the staff and married quarters.
Barracks.

The partition walls have now been removed, and they form a capital building, but have no accommodation for taking meals in ; the men, therefore, dine in the open verandah.

425.—Urinals require to be built at each, as also a latrine, the distance from the present one being much too great in the hot weather and rains.
Buildings required.

426.—Trestles or stands are wanted for the bathing-rooms, which are at each end of the Wash-houses. barrack, and connected with it by a covered passage.

427.—The canteen is very bad ; it stands in urgent need of ventilation, light, a new floor, and general repairs.
Canteen.

428.—The punishment cells are very hot, and require additional ventilation ; to secure this, the *godown* at present used as a Quarter Master's store-room might be advantageously pulled down, as another building is sanctioned for magazine purposes.
Punishment cells.

429.—The latrine was constructed on the *choola* principle, which never can be kept clean ; boarded seats and iron pans of the standard pattern should be supplied.
Latrine.

430.—The Quarter-guard was very good, but the latrine is sadly defective, there being no arrangement provided beyond a mere bar of wood, without vessels of any kind.
Quarter guard.

431.—For the Sudder bazaar there are public latrines, not in the bazaar itself but beyond the limits ; the people pay for the accommodation.
Sudder bazaar.

432.—The slaughter-house was very bad, there being no pucca flooring or channel for carrying off blood. The two small *naunds* in use were not half large enough, and the ground was necessarily saturated with blood. The Commissariat Officer stated that a new slaughter-house and cattle yard, on an improved plan, will be required to be built by the next contractor.
Slaughter-house.

433.—The distance to which the refuse and sweepings are at present taken is much too great to allow of its being removed sufficiently often. Dr. Maxwell states that the carts very often only go once a day, and I observe in the Executive Engineer's letter, No. 30 of the 10th of September last, it is recorded that the pits are $2\frac{1}{2}$ miles distant from the Artillery lines ! This completely negatives all efficient conservancy. Spots should be selected within half or three quarters of a mile only. (At the Lahore jail all refuse matter is buried in the garden within a hundred paces of the barracks.) There is no filth cart allowed for the arsenal, where it is much required.
Distance of the filth pits.

434.—European Infantry lines. At the hospital, very large cumbrous iron pans are used in the latrine ; they are much too big and heavy for the sweepers to lift easily, and unnecessarily expensive. A plan of the standard size should be at once indented for from Lahore as a pattern, and others made up from it.
European Infantry lines.

435.—The model privy is not looked after. There were no pans or *gunlahs* in it, though the latter were found behind the building not used. It has not yet been officially made over to either Regiment, (Infantry or Artillery) and hence, though used by the men, the sweepers do not clean it.

436.—The double latrines are good buildings, but they are provided with tin pans in wooden stands, between masonry partitions, and with no means of removing them from behind. Apertures should be at once made, and proper vessels supplied.

437.—No urinary exists in the station, but at the wash-houses there are open iron tubs—very offensive—placed one at each entrance. These ought to be fresh laquered immediately, (the metal being very much corroded,) and funnel-shaped covers also supplied to confine the effluvium.

438.—At the eight new iron barracks, the corner rooms used for Sergeants are much too small where the man is married and has a family. The defect might be remedied, without difficulty, by enclosing the verandah for a short distance.

439.—The married quarters, on the other hand, are very large and airy, with ample accommodation.

440.—The distant set of married quarters, constructed out of the former Native Hospital are very good, but cess-pools are being dug which should be stopped, and ventilation is required under the roof of the latrine, which has been adopted—partly on the new model plan—from an old one.

441.—In the Arsenal, the night latrine (used by all the Europeans after the gates are shut in the evening,) is built so close to the Officers' kitchen that they nearly touch each other; the urine from the former all flows out on to the ground in front.

442.—The large latrine presents a most disgusting appearance, every thing passing out into the open air, which is polluted by the sickening effluvium in every direction.

443.—At the urinary, two large iron vessels—each holding 15 gallons—were found to be full of urine that had accumulated from the day before. There were three sweepers on the spot, at the time, doing nothing, and they had no excuse to offer for their neglect. Neither the acting Sergeant or Officer commanding the detachment were aware of the circumstance. The Commissary of Ordnance stated that it had always been the custom to throw it in the open drain adjacent, until he had prohibited the practice.



444.—Much of what has been written on the sanitary state of the different barracks I have inspected, will necessarily appear to be a monotonous repetition of the same evils. But, as I am required to report upon the state

Explanation respecting the principal subject of report.

of conservancy at each station separately, the practical object had in view would not be attained by any remarks of a mere general nature. By putting on record the special defects of each cantonment, it is in the power of the authorities to apply the necessary remedy, and not to rest satisfied until it is done.

445.—But, lest it may be thought by those who have not paid the subject the attention it deserves, that the question of conservancy has little to do with Gravity of the question. health or disease, I would briefly recapitulate what are the facts gained by experience,—experience the most valuable because purchased at the expense of life.

446.—It has been already proved that all excretions and exhalations from the human body are noxious to health, and that, under certain circumstances, Reasons adduced. they are as destructive to existence as the most virulent poison. It is shewn by the cases cited by Professor Alison, Drs. Lindsay, Budd, Marshall, and Prichard, in England, and the researches of Liebig and Thiersch, on the Continent, that cholera is, in some cases, produced by the emanations arising from faecal matter.

447.—The British soldier serving in these provinces is exposed to this danger more than The European soldier is most exposed to the danger. any other class either of Europeans or Natives.

448.—The official medical returns show that, whereas in all other diseases there has been a gradual decrease of mortality among European troops in the Increasing fatality of cholera. three Presidencies, cholera alone presents a marked universal increase in the proportion of deaths to attacks.

449.—Wherever the laws of nature are disregarded, where—through ignorance—such an artificial state of things is produced as to localize and foster disease, Epidemics how generated. there the isolated case of sickness grows into an Epidemic, and pestilence sweeps off its victims with a relentless hand.

450.—And we have on record the most conclusive evidence to show that the same cause which produces typhus in England, will generate either jail fever or Similarity of origin in typhus and cholera. cholera in this country, according as it may exist in particular localities and classes.

451.—Let any unbiassed person read the published account of the Mahamurree or Indian typhoid plague, as it appeared at Kattywar in 1815, and in the The Mahamurree or Indian plague. mountainous region of Kumaon in 1851 and 1852, and say if he can honestly arrive at any other verdict than that recorded, as follows by Dr. Chevers :—

“This Epidemic affords one of the most demonstrative and convincing evidences, on record, of the fact that pestilential disease may be engendered as the *direct consequence of utter neglect of all hygienic rules and sanitary precautions.*”

452.—Let me refer to one more case, because, like the last, it occurred in the Himalayan range, at an elevation of nearly 5,000 feet above the level of the sea, Cholera in Kumaon. proving that the epidemic was not caused in any way by low marshy swamps or a high temperature, and it equally shows the intimate connection between disease and imperfect sanitary arrangements. I extract it from Dr. J. Browne's report on the cholera

of 1856 in Kumaon.

453.—“The ravages of this epidemic were so fearful that it is computed 6 per cent of the inhabitants of the valley were destroyed by it. The numbers who Dr. Browne’s report of its originating from dirt. died were 17,334, according to the Government returns. The habits of the inhabitants are extremely dirty, the flesh of the buffalo and pig is eaten freely, and spirituous liquors—to a greater or less degree—are indulged in by all classes. The houses are formed in squares, the central space being filled with filth of all descriptions giving out most fetid effluvia. My experience of the places in which I found cases of cholera would lead me to believe—what all our experience of this disease elsewhere illustrates—that in proportion to the sanitary defects of a house or locality, so will be the mortality from cholera. The immunity of the royal family and several of the aristocracy living in the same town from cholera confirms this, as they occupied houses provided with good sanitary arrangements.”

454.—Does not the above description tally in all essential points with what is at present the condition of many of our large cities and cantonments, such as I Present sanitary condition of many towns and cantonments precisely similar. have shown to be the case at Delhie, Peshawur, and Umritsur? Is there not the overcrowding and want of ventilation, the reeking effluvia of the latrines, the decomposing excreta remaining unremoved and unburied? Does not the food correspond too closely with that consumed by the European soldier, and the same exception to be met with in those whose lot affords them protection from the evils he is exposed to?

455.—Not only does the case of the European Officer present a most marked contrast to the private soldier, as regards immunity from disease and recovery Immunity of European officers and others from cholera. when attacked, but the same result will be found to exist with other classes in the same regiment that approach the soldier still nearer in his social position and daily circumstances of life.

456.—Struck by the meagre information furnished in the usual hospital returns, which Analysis of Medical returns. aggregate all cases under the one comprehensive designation of “rank and file,” and anxious to ascertain how far the particular occupation of any class in a Regiment, with the collateral circumstances connected therewith, might tend to exempt its members from disease of an epidemic character, I suggested an analysis of many of the cholera returns of last year, according to a new form, (Appendix F.) and which I think well worthy of earnest consideration.

457.—I find from the returns of Regiments which suffered severely from cholera in different parts of the province, that the great bulk of cases occurred Striking results exhibited from this analysis. amongst the unmarried privates who had no special duty assigned them, while those of their comrades who were married, or who had any particular occupation to employ their time connected with the duties of the Regiment, were much more exempt. The same result appears also both in the case of the commissioned and non commissioned Officers, (with the exception of the Sergeants of Companies whose duties were very severe.) The servants, including even sweepers and hospital attendants, almost entirely escaped; while, on the other

hand, the men of the Band suffered very severely, and this has been remarked as a peculiar fact in several Regiments, not only in this but in former years also.

458.—It will be at once seen, on looking at the following table, in how many cases the circumstances of a particular class in the Regiment differ widely from that of the ordinary private. Thus the Staff Sergeants, and those who occupy detached bungalows and the end-rooms of the barrack, or who sleep away from the barrack altogether, escape the overcrowding and poisoned atmosphere at night time, while others, such as those employed at the Mess or the Officers' quarters, obtain a greater variety of food and better cooking. The majority are exempted from the fatigue and exposure of night duty, many escape parade altogether, and, lastly, all have some occupation which engages their mind throughout the day, and being, as it were, the subordinate staff of the Regiment, they are careful to avoid intemperance and vice, or excesses of any kind, for fear of losing their appointments :

459.—

Tabular statements
in illustration.

	Total strength of each class.	Rank and special duty or occupation.	Cholera.		REMARKS.
			No. of cases.	No. of deaths.	
89th Regiment at Umballa.	27	Commissioned Officers,	"	"	Of the total number of cases 17 occurred in camp, and 44 in the lines. Of these 44, it is worthy of notice that 15 cases (or one third of the whole) were in hospital when attacked with the disease.
	5	Officers' wives,	"	"	
	3	Do. Children,	"	"	
	108	Warrant and Non Commissioned Officers,	1	1	
		Privates employed on special duty,	Not separately shewn		
	39	Do., Married,	3	2	
	716	Do. Unmarried,	54	39	
	20	Bandsmen,	3	3	
	"	Wives of Non Commissioned Officers,	"	"	
	"	Children of ditto,	"	"	
39	Soldiers' wives,	3	2		
57	Do. children,	9	8		
60	Cook boys, sweepers, and hospital servants,	1	"		
82nd Regiment at Delhie.	21	Commissioned Officers,	"	"	
	3	Officers' wives,	"	"	
	4	Do. children,	"	"	
	51	Warrant and Non Commissioned Officers,	4	2	
	53	Privates employed on special duty,	3	"	

	63	Do. married,	} Not employed on special duty,	4	2
	782	Do. unmarried,		70	35
	27	Bandsmen,		"	"
	10	Wives of Non-Commissioned Officers,		3	3
	5	Children of do.		1	1
	49	Soldiers' wives,		11	4
	70	Do. children,		13	4
	198	Cook boys, sweepers, and hospital servants,	}	5	5
94th Regiment. Left wing at Umitsur, Right wing at Meean Meer.	23	Commissioned Officers,		"	"
	3	Officers' wives,		"	"
	5	Do. children,		"	"
	156	Warrant and Non-Commissioned Officers,	}	26	22
	40	Privates employed on special duty,		3	"
	12	Do. married,	} Not employed on special duty.	2	1
	838	Do. unmarried,		244	173
	30	Bandsmen,		18	14
	18	Wives of Non-Commissioned Officers,		2	2
	16	Children of ditto,		4	4
	19	Soldiers' wives,		3	3
	13	Do. children,		"	"
	145	Cook boys, sweepers, and hospital servants,	}	4	1
51st Regiment at Meean Meer.	37	Commissioned Officers,		3	1
	5	Officers' wives,		"	"
	2	Do. children,		"	"
	107	Warrant and Non-Commissioned Officers,	}	30	26
	30	Privates employed on special duties,		3	3
	39	Do. married,	} Not employed on special duty.	20	12
	818	Do. unmarried,		414	204
	33	Bandsmen,		10	8
	19	Wives of Non-Commissioned Officers,		5	3
	27	Children of ditto,		6	4
	39	Soldiers' wives,		16	13
	53	Do. children,		20	18
	174	Cook boys, sweepers, and hospital servants,	}	3	1

460.—If this system could be extended, by some of the present duties being taken in turn by the whole regiment, or if instead of 5 per cent. we could even find special employment for double that number, would not the same benefits be manifested? Is there not sufficient evidence to show that the result is not a mere fortuitous one, but that life and health would be largely saved, if we could employ many more of the privates in the same way? Is not the experiment worth trying? It is merely an extension of what has already been commenced, and with such marked good.

461.—Let these kind of appointments be largely increased, let the soldier feel that he is no longer a mere human automaton, that is wound up on the parade-ground, and then relapses into mere animal existence during the next 24 hours, but appeal to his reason, and put him into some small post of honor or trust, and certain it is that the end gained will be a marked improvement both in the physique and morale of the army.

462.—I believe that a single day passed in a barrack would convince any one of the soundness of my argument, and would lead to the object I have at heart being secured. At the time of the outbreak of cholera at Murree in August 1858, I used to visit the depot very often with Sir John Lawrence, and was so struck with the listless appearance of the men and their total want of occupation, that I no longer wondered at their succumbing to the disease in such numbers.

463.—No one seemed to care about anything but how to get through the day, or to “kill time” as it was termed. Exercise and occupation were alike unknown to and unpractised by the majority. They had no gardens, they did not walk out, or play at any game, but each man lay on his bed, either smoking or sleeping until it was meal time. They would then get up, eat a heavy meal of beef washed down by a glass of grog, go to bed, smoke, sleep, and get up to eat again. In some cases, I was assured that they ate meat three times during the 24 hours, and there was no variety even in that; the same monotonous dish of fried beef and onions appeared always on the table.

464.—Let it ever be remembered that disease is to a great extent preventable. We get into the habit of referring all casualties to “the visitation of God,” whereas, if we spoke correctly, the proper expression would be—“the visitation of man.” Providence has given us certain laws for our guidance and observation, and as organized beings we must either obey those organic laws or suffer the consequences of our neglect.

465.—Strange to say, we admit the truism in many cases, and yet ignore it in others. We know that certain trades are injurious to health, and that others shorten life, but yet we know that, by the aid of art, an antidote to the danger has been in every case discovered. We acknowledge that the act of entering a coal-mine with any but a “safety lamp” is as clearly an act of madness or murder as that of scuttling a vessel, or exploding a magazine of gun-powder. We are horrified at a sanguinary battle

or the loss of life occurring either by fire or shipwreck, we punish the man by whose neglect a railway or steam-boat accident occurs, and yet we see hundreds prematurely perishing around us from an epidemic, the cause of which, instead of regarding as equally evident, we choose in our blindness or wilfulness to ignore. It is possible to breed cholera or typhus, just as it is to poison the food or water that our fellow creatures partake of, and, where it is shown that these diseases arise from neglect and indifference on our part, we are as surely responsible for the lives of our fellow creatures, as if they had perished by an equally preventable accident caused by any act of our own.

466.—Concluding then with this axiom—the preventability of disease, let us admit as an equally great truth, that it is in the power of every one to do something in his own sphere of action towards such an object. The officers of a regiment can do much by providing occupation for the soldier, which will not only employ his time but engage his interest, and they can make the barrack a more healthy and comfortable home than it is at present. And the men themselves may do much in restraining their companions from the temptations of the canteen and the bazaar, from those excesses which, we are told, “are as the ways of death unto a man.” Let no one despair because the task appears a difficult and arduous one. Where hand and heart combine, where our exertions in a good cause are continuous and not merely spasmodic, we may indeed hope to remove mountains.

467.—The untiring exertions of earnest individuals, such as Dr. Letheby, Dr. Sutherland, and Mr. Simon in London, Dr. Angus Smith in Manchester, and Florence Nightingale in the Crimea, have already borne noble fruit. And we have the satisfaction of knowing that their example has stirred up others, that the attention of Government has been drawn to the subject of Military sanitary reform, as one of the pressing questions of the day, and that a Commission on the health and condition of the army in India is, at the present time, earnestly considering those gigantic evils, which require the interference of the State for their removal.

C. HATHAWAY,

Inspector General of Prisons,

and Special Sanatory Commissioner.

LAHORE,

14th May 1862.

The first part of the paper is devoted to a general
discussion of the subject. It is shown that the
theory of the subject is not yet complete, and
that there are many points which require further
investigation. The author then proceeds to a
detailed examination of the various theories which
have been proposed, and shows that none of them
is entirely satisfactory. He then proposes a new
theory, which he claims to be more complete and
more satisfactory than any of the others. The
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than any of the others.

PLANS OF PROPOSED
New Latrine and Urinary
for
EUROPEAN TROOPS
DESIGNED BY D. HATHAWAY
Special Sanitary Commissioner.

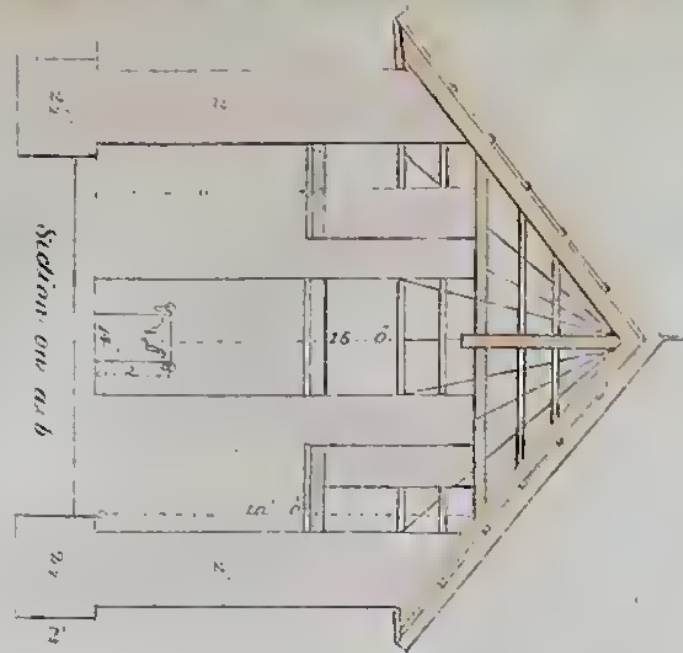


Fig. 7.

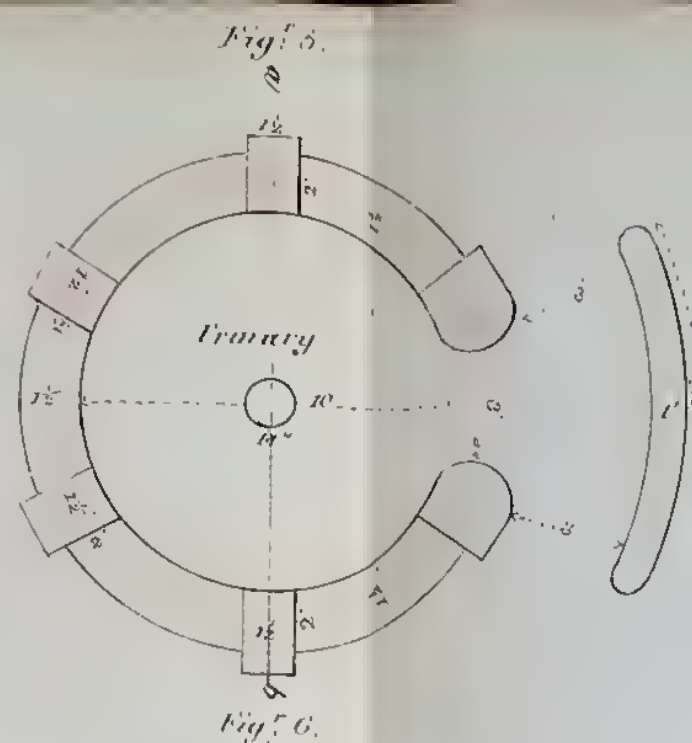
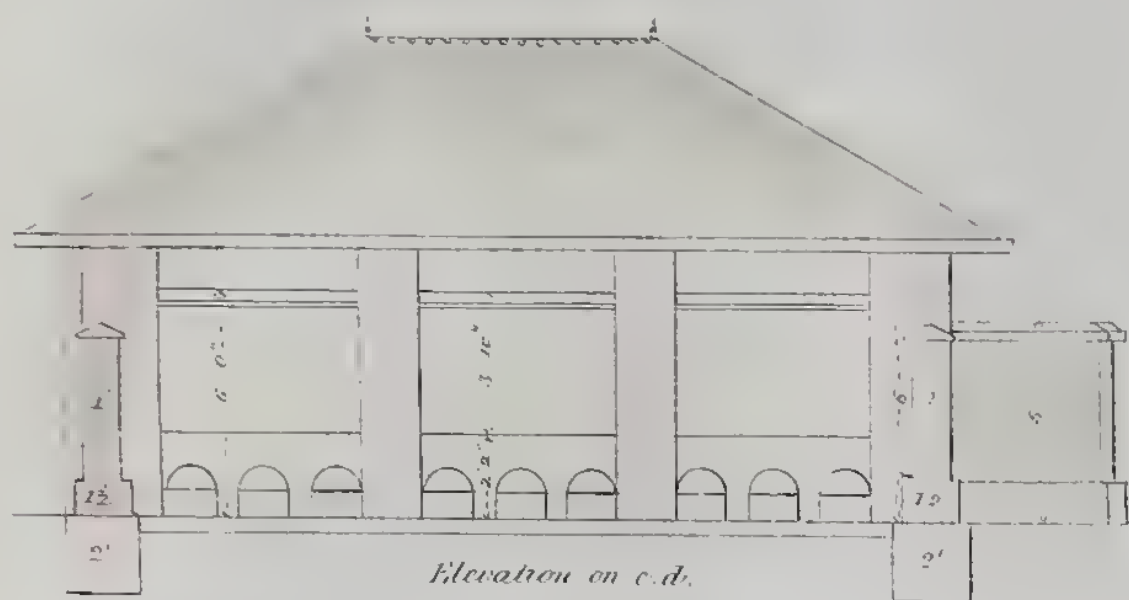
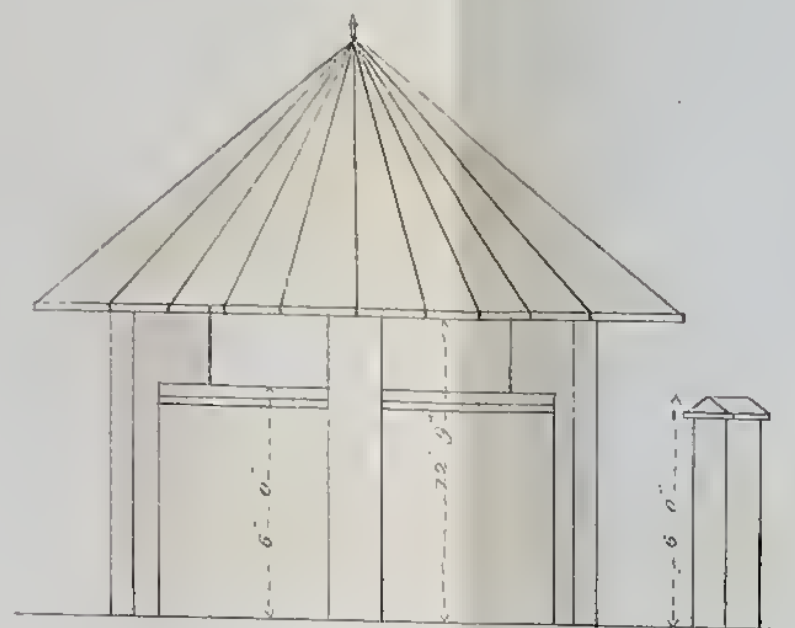


Fig. 6.



Elevation on c-d.



Elevation.

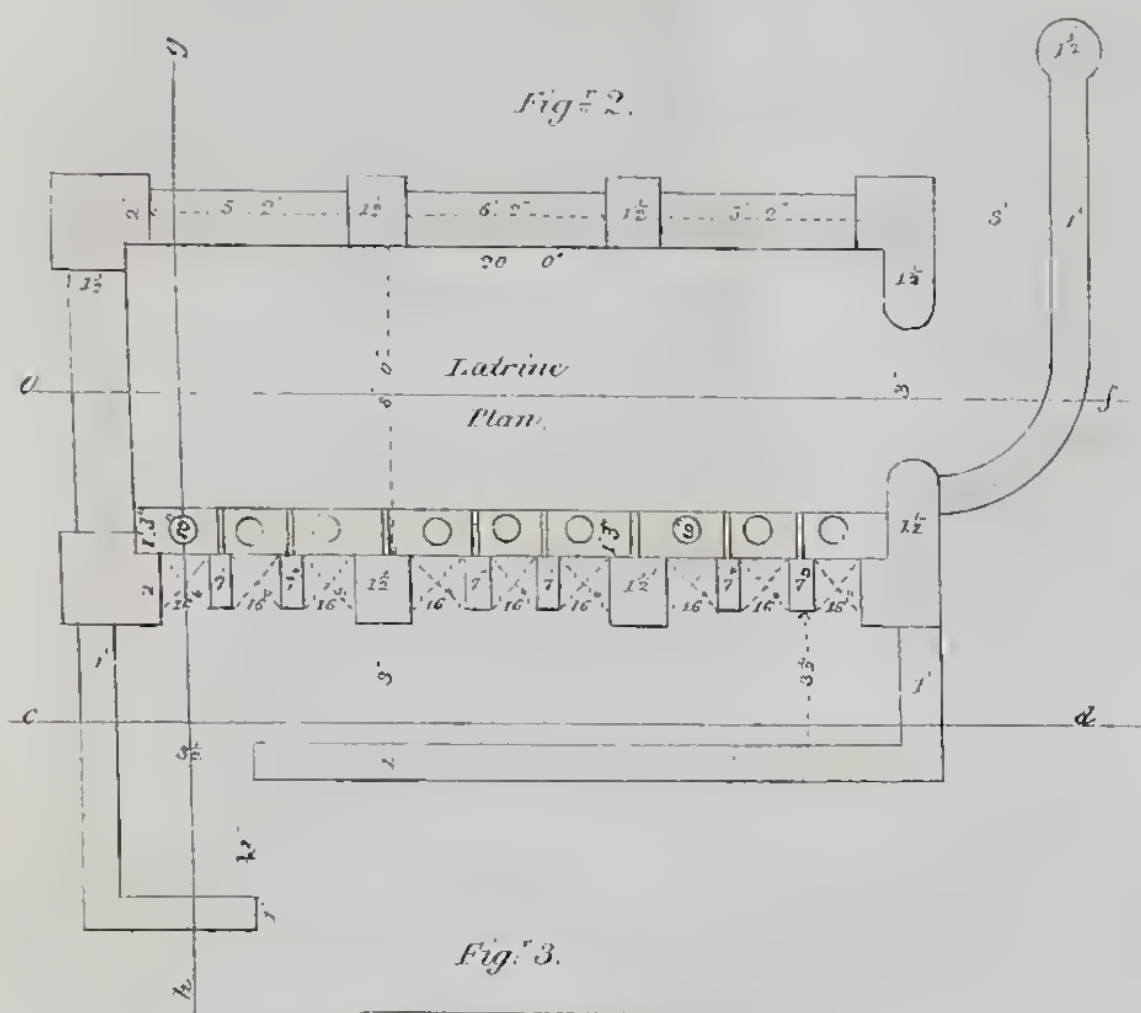


Fig. 2.

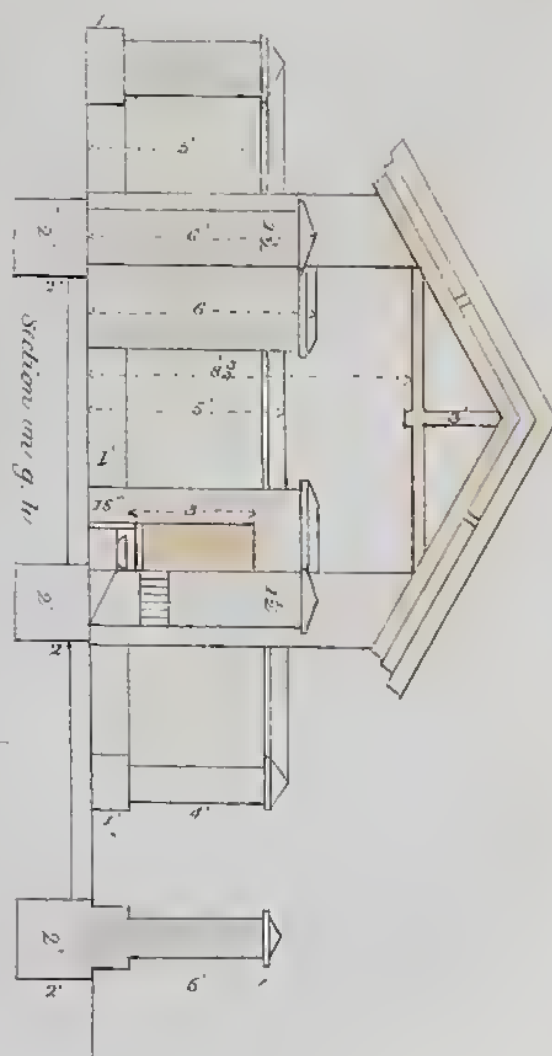


Fig. 4.

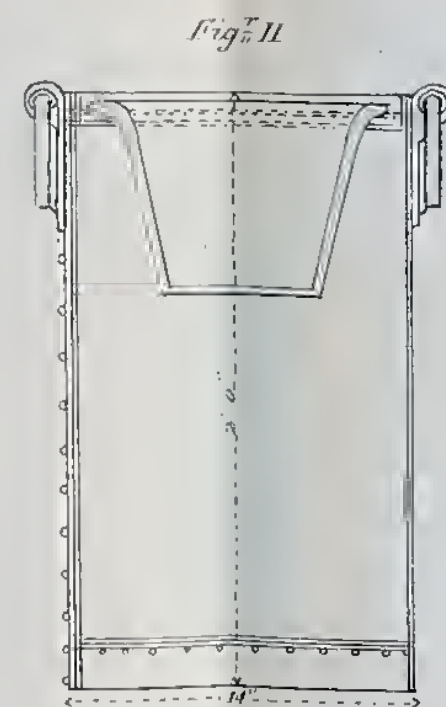


Fig. 11.

Urinal

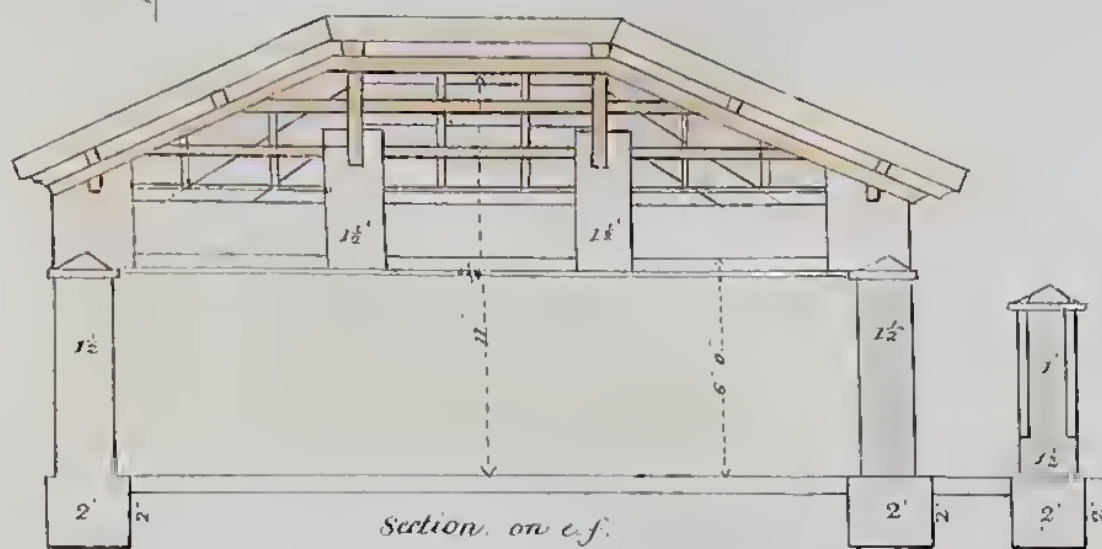


Fig. 3.

Section on e-f.

Fig. 9.

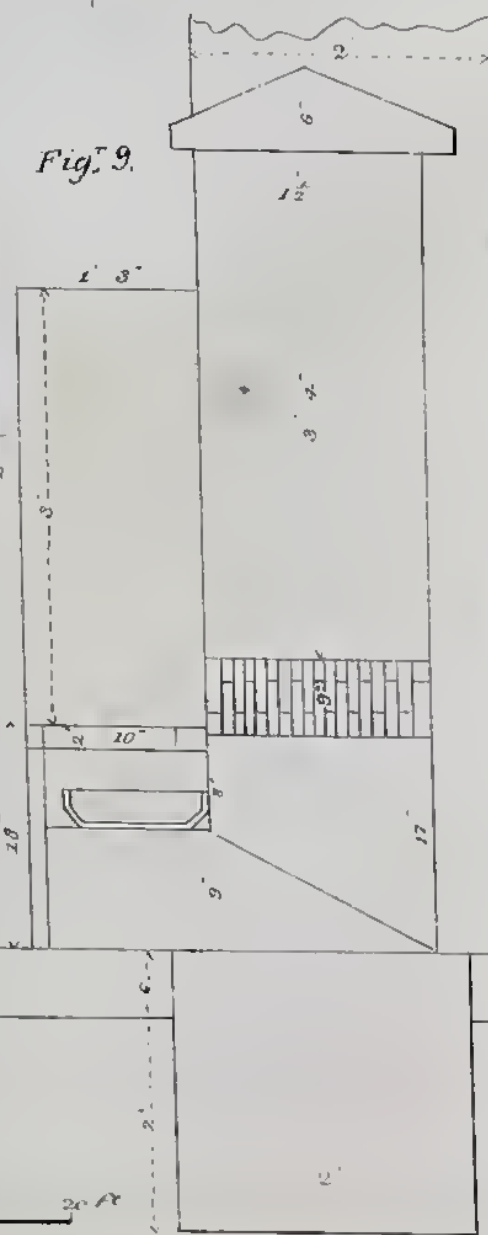


Fig. 8.

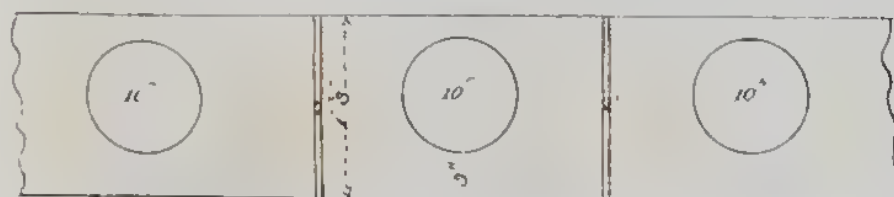
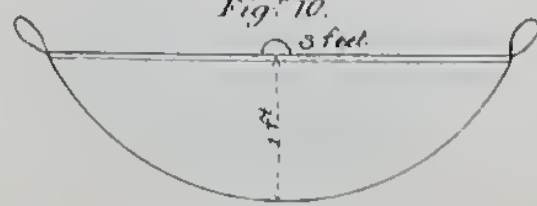
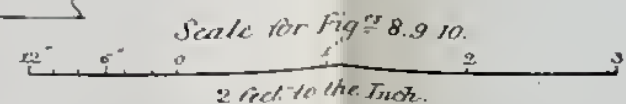
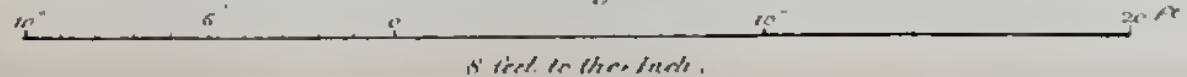


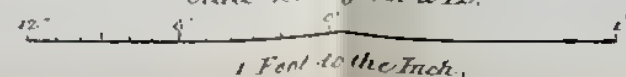
Fig. 10.



Scale for Fig. 11 & 12.



Scale for Fig. 11 & 12.





APPENDIX.



SPECIFICATION FOR NEW LATRINE AND URINARY.

All foundations and plinths to be of kutchha pucca masonry, and the superstructure in rear walls of latrine (up to line marked on plan), as also the pillars supporting the roof; all the rest to be of kutchha brick-work constructed of sun-dried bricks set in mud; the bricks to be well shaped and of uniform size, bond to be preserved, and joints kept as fine as possible.

All walls to be kutchha plastered inside and out; the kutchha plaster to consist of clay loam, well worked up with chopped straw, and when of a proper consistency to be laid on the work, which will be previously damped as much as possible without injuring the bricks; to be then brought to an even surface with trowel, and *leaped* when dry with a mixture of clay and *gobur* (cowdung) in equal parts, thoroughly mixed together.

Thatch to consist of a six-inch coating of fresh grass, laid on matting or *sirkee* over a bamboo framework.

The wood employed in the roof trusses to be of any sound seasoned wood procurable; to be cut to the specified dimensions, and all the joining carefully executed.

Kutchha pucca archways to be made as shown in plan, one in rear of each seat, through which the sweeper from behind can remove the pans; these should be raised either on wooden battens or an earthen terrace, made of such a height that the pans will be within 1 or 2 inches of the seat, to prevent slopping and other nuisances.

The seats to be boarded with 2 inch planks, having circular apertures 10 inches in diameter, and retired 3 inches from the front. The height of the seat to be 18 inches *exactly* in the clear.

Wooden partitions to be made between each seats for privacy.

The iron receptacle for removing filth from the latrine to be one of the common *karailhs* to be seen in bazaars at any native shop: the rings at the end are for a bamboo pole which will be passed through both, and by which it will be carried. The lid to be merely a sheet of iron (without any rim or lip) fitting loosely *inside*, with a small handle on the top by which it can be taken off.

The iron urinal to be similar to the Government pattern circulated 30th September 1858, but the upper lid with hinge and hasp for padlock to be omitted, so that it can easily be made up in any bazaar. The inner pan can be of earthenware.

The latrine pans to be the common shallow earthen vessels sold in the bazaar under the name of *Koondahs*, such as are used by masons for holding mortar. Where these can be obtained with the inner surface glazed, it will be an improvement.

MINUTE BY GENERAL BECHER, C. B.,
Quarter Master General of the Army.

"I consider the plan of latrine and urinary designed by Dr. Hathaway a great improvement on the existing arrangements, and I strongly recommend their being adopted experimentally without delay."

SIMLAH,
15th November 1862.

(Signed) A. M. BECHER,
MAJOR GENERAL.

ABSTRACT of the Cost of a Latrine and Urinary constructed on

DR. HATHAWAY'S design.

LATRINE.		Rs.	A.	P.	Rs.	A.	P.			
450	Cubic feet of excavation @ 0-3-0 per 100	„	13	6						
982	„ Kutchu pucca masonry @ 7	68	11	10						
496	„ Kutchu masonry @ 2-8-0	12	6	5						
1425	„ Timber (Deodar) @ 1-0-0 per foot	14	4	0						
460	Supl. feet of thatching (6 inches) @ 5 per 100	23	0	0						
18	Koondahs @ 0-4-0 each (or at any lower rate procurable.)	4	8	0						
1,381	Supl. feet of kutchu plaster @ 0-8-0 per 100	6	14	6						
134	Cubic feet of sand @ 1-8-0	2	0	2	132	10	5			
SEATS IN WOOD.										
56	Cubic feet of timber (Deodar) @ 1 per foot	5	9	7						
147	Supl. feet of painting @ 2-8-0 per 100	3	10	10	9	4	5			
<i>Total,</i>					141	14	10			
<i>Add Contingencies @ 5 per cent.</i>					7	1	6			
<i>Total cost of Latrine,</i>								149	0	4
URINARY.										
188	Cubic feet of excavation @ 0-3-0 per 100	0	5	8						
400	„ Kutchu pucca masonry @ 7	28	0	0						
254	„ Kutchu masonry @ 2-8-0	6	5	7						
11	„ Timber @ 1 per foot.	11	0	0						
340	Supl. feet of thatching (6 inches) @ 5 per 100	17	0	0						
572	„ Kutchu plaster @ 0-8-0	2	13	9						
42	Cubic feet of sand @ 1-8-0	0	10	1						
1	Urinal, @ say 5-0-0	5	0	0	71	3	1			
<i>Add contingencies at 5 per cent.</i>					3	9	0			
<i>Total cost of Urinary,</i>								74	12	1

C. HATHAWAY, M. D.
Special Sanitary Commissioner.

B.

Meean Meer, B. O. 807, dated 10th April 1861.

Proceedings of a special Committee ordered to assemble at the Lahore Central Jail to report on latrines and urinaries in the prison, with the view of a trial of the system of conservancy adopted in the jail in the Military Cantonments.

PRESIDENT.

LT. COLONEL ARTHUR HALL, R. M'S. 3RD LT. CAVALRY.

MEMBERS.

LT. COLONEL G. BOURCHIER, C. B., HORSE ARTILLERY.

SUPERINTENDING SURGEON, W. GREEN.

SURGEON J. SCOTT, M. D., R. M'S. 79TH REGT.

CAPTAIN S. BLACK, EXECUTIVE ENGINEER.

MEEAN MEER, 25TH MARCH 1862.

The Committee, having assembled, proceeded to examine the arrangements in use in the Lahore Central Jail, and found that in each yard a small slightly raised space, enclosed by a mud wall and without a roof, is set apart as a privy; the flooring consists of a bed of well rammed clay, 6 inches in thickness, and covered with loose dry sand.

The prisoners defecate into an open basket containing some wood-ashes, and pass their urine into a *chattee*, so that neither soil nor urine is allowed to come in contact with the floor.

The basket and *chattee* are removed four times a day, and the contents buried in a deep trench in the garden outside the jail wall.

In each dormitory there is a urinary on the same principle. The use of water for either flushing or cleansing either privy or urinary is strictly prohibited; the result of these arrangements is, that the yards and dormitories are kept quite free from any offensive effluvia.

The Committee further recommend:

1.—That the general principle laid down in Government Circular letter No. 5,154, of 30th July 1859, be without delay carried out, wherever cess-pool privies may be in use.

2.—That all pucca work and mortar likely to come into contact with urine should be covered with a thick coating of kutcha plaster.

3.—That the sprinkling of lime in privies and urinaries be discontinued, and a mixture of wood-ashes and refuse charcoal be substituted.

4.—That the use of water for flushing or cleansing be strictly prohibited.

5.—The Committee are of opinion that portable pans and urinals seem best adapted for the efficient working of the dry surface system, but the Committee would leave the minor details to the Executive department.

(Signed) A. HALL, LT. COL. 3RD LT. CAVALRY, *President*.

G. BOURCHIER, LT. COL. B. H. A.

W. A. GREEN, SUPG. SURGEON.

S. BLACK, CAPT., EXECUTIVE ENGINEER.

J. G. SCOTT, M. D., SURGEON.



Report of the standing Barrack Committee, assembled by order of Colonel M. Smith, Commanding at Jullundur, on the result of the experiment of constructing a privy and urinary on the principle recommended by Dr. Hathaway, Special Sanatory Commissioner in the Punjab, and the alteration on the same principle of one of the privies and urinaries in the European Infantry Lines.

PRESIDENT.

COLONEL M. SMITH, COMMANDING AT JULLUNDUR.

MEMBERS.

SURGEON STONEY, SENR. SURGEON H. M'S. 94TH REGIMENT.

MR. R. G. ELWES, ASSISTANT ENGINEER JULLUNDUR DIVISION,

CAPTAIN B. SOADY, BARRACK MASTER JULLUNDUR.

The Committee having examined the privies and urinals indicated, and having made enquiries as to the practical working of the system recommended by Dr. Hathaway, are of opinion that highly desirable and beneficial effects have resulted from their adoption at Jullundur.

The Committee recommend that the plan of the model privy and urinary in the Artillery Lines be generally established for all such buildings allowed for the use of European Troops; and that, in the mean time, all the existing privies and urinaries of the old plan be at once altered, as in the case of No. 1 privy in the European Infantry lines.

The Committee find that two urinals in each urinary appear to be insufficient; at least four in each should be furnished.

The privy pans should be supplied with handles for convenience of removal.

When the alterations have been made, and the plan is generally adopted, the committee consider that a larger conservancy establishment will become necessary, as one of the main objects in view is the constant attendance of a sweeper at each privy, for the immediate cleaning of the pans after being made use of, and the frequent removal of the collected refuse from the large receptacle during the day.

The complete success of the system will mainly depend on strict Regimental supervision.

The model privy in the Artillery lines having been constructed with wooden uprights has already been attacked by white ants which abound at this station; in future, the uprights should be of masonry.

(Signed) M. SMITH, Col., President.

„ H. STONEY, Surgeon, 94th Regiment.

„ R. G. ELWES, ASST. ENGINEER,

„ B. SOADY, CAPTAIN.

} MEMBERS



Report of a Committee assembled at Delhi on Monday the 18th of November 1861, by order of Brigadier J. D. Dennies, Commanding the garrison, for the purpose of considering the conservancy arrangements necessary, consequent on the prohibition of cess-pools, in the vicinity of barracks, and to form an estimate of the extra expence involved thereby.

MEMBERS.

Lieutenant Colonel PATERSON, Late 4th N. I.

SURGEON H. D. FOWLER, H. M's. 82d REGIMENT.

Mr. C. CAMPBELL, EXECUTIVE ENGINEER.

The Committee having assembled, and examined the various cess-pools, &c., brought to their notice by the Barrack Master, resolve upon the following report :—

Delhie, 18th November 1861.

1st. We are opinion that the system advocated by the principal Medical Officer of H. M's. forces in India and the Special Sanatory Commissioner of the Punjab, and generally known as the "dry system," should be adopted in all the privies and urinaries in use by the troops. For the sake of convenience, we here note the principal features of this scheme; they are—

A. The absence of all lime from the privies, &c., whether used in the shape of quick-lime as a sanitary measure, or employed in mortar for the walls and flooring.

B. The reception of all urine and excreta in movable vessels, which can be emptied into iron tank carts, and so removed to a distance from the barracks and buildings. This, of course, implies a strict prohibition of all drains, drain-pipes, or any thing of a nature which will not admit of its being thoroughly rubbed and cleaned when necessary.

C. Keeping the pots, &c., used at a distance from the walls of the building in which situated, so as to prevent the men fouling the latter in any way.

D. Having the flooring composed of dry river sand for a depth of 6 inches, so that any defilement can be quickly and easily removed.

E. The provision of ventilation to the fullest extent consistent with privacy and protection from the sun.

F. Reducing the number of seats to a minimum, and forming them either of polished iron or wooden bars, which can easily be scraped and kept clean. These bars to be attached to moveable stands, so that they can easily be taken away and cleaned when necessary.

G. Keeping the internal walls always clean by having them *leaped* weekly by the sweepers.

H. The instant removal, as soon as used, of the pot or pan, and the substitution of a clean one for the next comer.

2.—Having considered the style of vessel best suited for the purposes intended, we are of opinion that the thick glazed earthen-ware pans, of the shape used in the Delhie jail, are the best fitted for the privies. They are cheap, easily kept clean, not quickly broken, and easily replaced in the event of any accident. As they are too shallow to prevent slopping, when placed too far from the person using them, we recommend their being set on a light iron stand or *tea-poy*, so as to bring them within 4 inches of the top of the sitting rail.

3.—For the urinaries we recommend the standard tubs made of iron, thickly painted inside, with enamelled iron or glazed earthen-ware covers, having an aperture leading into the pan of only one inch in diameter, so as to keep the effluvia from escaping.

4.—As regards the means for keeping these places clean, we are strongly of opinion that two mehters—at least—should be attached to every privy, one of whom should always be on duty; that he should be bound to remove, and replace with a clean one, every pan so soon as used; and that he should be bound on his engagement to “lepy,” without any extra expense to Government, the walls of the privy and urinal under his charge, to a height of 6 feet, once every week.

5.—We recommend that small huts, each 10×8 feet or thereabouts, be erected close to the privies, as a residence for the mehters attached to them.

6.—We further recommend that these mehters be relieved of all work about the barracks, and that the duty of sweeping these out and keeping them clean be committed, either to other servants, or else to men selected from each company, as is done in barracks in England.

We should prefer this latter arrangement, as it will tend to keep the soldiers employed, and the work is in no way irksome or degrading.

7.—For the removal of the excreta and urine, we recommend that iron tubs furnished with handles, be provided for each privy, into which the pans can be emptied as used. These tubs will be emptied once or twice a day into an iron tank conservancy cart, which will go round for the purpose, and which will convey the excreta to a “night soil depôt,” situated at a distance of at least $\frac{1}{4}$ of a mile beyond the limits of cantonments. There should be three of these carts for the troops in Garrison,—viz, one for the troops near the Cashmere Gate, one for those inside the Palace, and one for those stationed at Durriao-gunge.

8.—As regards cook-houses, we recommend that a dust-box of iron or wood be placed in each, into which all lees, refuse, and sweepings should be thrown. Where, as is generally the case in Delhi, there is good under-ground drainage from the place, we would allow all dirty water to pass off through a sink (having an aperture of 1 inch only) connecting it with the sewers. Where, however, these latter do not exist, we would still retain the sink, placing under it an iron tub, similar to those described in the last para., which should be removed as fast as filled, and should be emptied into the tank cart when it comes round, like the contents of the box. Four of these iron tubs would, in this case, be probably required for each cook-house, in addition to the dust-box.

9.—As all these buildings are—however well they may be kept up—more or less nuisances, we are of opinion that their number should be kept to the minimum absolutely necessary to the comfort of the men.

This minimum we consider to be, cook-houses, one to every 100 men,

privies, do. „ do. „ and

urinals do. „ do. „

10.—The privies should be placed as near to the barracks, on the leeward side, as possible, not more—when practicable—than 100 yards. The receiving tubs being placed, 200 yards from any building, in a small enclosed space (or receptacle), which should have a low screen wall, 3 feet high, erected around it.

11.—The same remarks apply to the cook-houses, except only that the dust-boxes, &c.,

need not be removed from the vicinity of the building.

12.—The situation of the urinaries is one that requires great consideration. If too far from the barrack the men will not use them, but are sure to defile every corner they can find. The same is certain to happen at night, especially in the cold weather, when it is no light matter to turn out in scanty drapery for so slight a purpose of nature.

13.—To carry out the dry system in its integrity, (and nothing less than this should, in our opinion, be attempted) it is absolutely necessary that a properly organized system of inspection should be set on foot, and strictly adhered to. The details of such a system appear to us to be as follows :—

A. Every soldier or sepoy wilfully fouling a privy or urinal, or any place about the barracks, to be punished for so doing.

B. Breakages of pans to be made good by parties causing them, whether soldier or melter, unless they are due to bonâ fide "fair wear and tear."

C. An Orderly to be appointed from each company, whose duty it shall be to inspect twice a day every privy, cook-house, receptacle, and urinal in use by the men of his company, reporting to his immediate commanding Officer the result of his inspection. The melters attached to each company will be under the orders of this Orderly, who will be responsible that they discharge their duties in an efficient manner.

D. The Officer commanding a company shall four times—at least—in every month, inspect the privies, cook-houses, receptacles, and urinals belonging to his men, noting the result in a report to be submitted to the Officer commanding the Regiment, who will be thus enabled to remedy promptly any evils that may arise.

E. The duty of the Regimental authorities should, we conceive, cease with the depositing of all excreta and offal in the receptacles within their lines. The removal of them thence to the night soil depôts, should be effected under the authority of the Officer in charge of the station conservancy; to assist whom, we recommend the appointment of a conservancy Sergeant, with fitting pay and allowances, whose duties would be to superintend the removal of all filth from the station, and supervise the establishment so employed, and who would be bound to visit, at least once every 4 days, every privy, cook-house, receptacle, and urinary attached to the barracks, and every public latrine, serai, open ground liable to defilement, and encamping ground within the limits of cantonments. (Some one of these being, of course, visited daily, so that in 4 days he will have seen them all once.) The result of his inspections to be embodied in a report to be submitted to his superior Officer, who—after countersigning it—will lay it before the Brigadier Commanding the station, who will thus be kept fully acquainted with the sanitary condition of the cantonment.

14.—The sanitary report of the Quarter-Master of the week, and of the senior Medical Officer, will come in as useful checks on the general conservancy arrangements.

15.—In conclusion, we beg most strongly to recommend that the conservancy system now laid down be extended to the city and cantonment, throughout both of which public latrines with earthen-ware vessels, (and melters attached), like those already described for the Na-

tive troops, should be erected in sufficient numbers, and at convenient places, for the Native population. The arrangements for the city must be made by the Civil authorities ; to suggest those for the Military cantonment would seem to come within our province, and we beg, therefore, to recommend that 13 public latrines be erected, and kept up at the expence of the various cantonment funds, and that strict police regulations be enforced to make the Natives use them ; those who do not being punished accordingly. Each latrine should contain 30 pans with 6 iron receiving tubs, and should have 2 mehters attached, who would be under the directions of the conservancy Serjeant.

16.—We recommend that the owner of every house occupied by Officers or other Europeans, shall be bound to provide a sufficiency of iron receiving vessels and dust-boxes, into which the tenant may cause to be emptied all the excreta and offal accumulating in his compound. Iron tank carts should go round daily to collect and carry the contents of these away.

17.—For the public latrines and general conservancy of the station, we recommend that three tank carts be provided in addition to those allotted to the troops, or—what would be the better arrangement—that six carts be allowed for the whole of the conservancy ; the cantonment being divided into six districts or wards, having a cart allowed to each.

18.—The estimate of cost for establishments recommended is as follows :—

No.	Description.	Rate.	Proposed Estab- lishment.	Establishment at present sanction- ed by Govt.	Saving by new system.	Excess by new system.
	EUROPEAN TROOPS.		Rs.	Rs.	Rs.	Rs.
30	Mehters, ~ ~ ~ ~ ~	4-0	120	96		
	Lime for sanitary purposes, ~ ~ ~			57		
			120	153	33	
	NATIVE TROOPS.					
8	Mehters, ~ ~ ~ ~ ~	4-0	32	56	24	
	PUBLIC LATRINE.					
26	Mehters, ~ ~ ~ ~ ~	4-0	104			
	GENERAL ARRANGEMENTS.					
4	Mehters attached to the soil depôt, ~ ~	4-0	16	96		
4	Labourers, do., do., ~ ~	3-12	15			
1	Conservancy Serjeant, ~ ~ ~ ~	20-0	20			
	Horse allowance for ditto, ~ ~	15-0	15			
			170	96		74
	<i>Total for the whole scheme.</i>		322	305		
	<i>Total excess of new system,</i>					17

Note.—It will be seen that there is a positive saving so far as the troops are concerned. The excess is in the public arrangements, and can easily be met from the cantonment funds.

(Signed) C. PATERSON, LT. COL. AND PRESIDENT.

„ H. D. FOWLER, SURGEON R. M. 82ND REGT.

„ C. CAMPBELL, C. E. EXE. ENGINEER.

E.

From

J. T. C. ROSS, Esqr.,
SURGEON H. M'S. 21ST HUSSARS,

To

A. WILSON, Esqr.,
DEPUTY INSPECTOR GENERAL OF HOSPITALS.*Peshawar, 17th June 1861.*

SIR,

I have the honor to submit for your consideration that the prostitutes residing in the Sudder bazaar should periodically be medically examined.

2.—On looking over the returns of H. M's. 7th and 98th Regiments for the year 1860, and comparing them with the returns of H. M's. 51st and 79th at Meean Meer, (where there was a Lock-hospital under my charge) I find disease was not more rife here than there ; but, that disease among the prostitutes in the Sudder bazaar exists in a large ratio is proved, in that during the last two months (from 16th April to 16th June) I have had 15 admissions in my hospital from disease contracted there, against 47 admissions only during the whole of the year 1860, at Meean Meer. If the admissions continue in a like ratio, it would give me 90 cases in the twelve-month,—just double the admissions of last year.

3.—Sixty-three prostitutes are at present in the Sudder bazaar, and are in charge of a *chowdery* and a midwife : they are liable to no medical inspection, but, when they are diseased, the latter person takes them to the general hospital for treatment.

4.—The existence of a general hospital (under the staff Surgeon) renders the establishment of a Lock-hospital unnecessary ; but, as no regular examinations are made, and the detection of disease only rests on the activity of a Native midwife, I beg to submit for your consideration that a weekly inspection should be made of each woman resident in the bazaar by a Medical Officer.

5. The system of examination by Native agency has been found entirely to fail for many reasons which must occur to you. At Meean Meer the women—both in the Regimental bazaar and in the Sudder—were examined every week by a Medical Officer, and to this measure (a most important feature in a Lock-hospital, on the principle that prevention is better than cure) being strictly carried out, I am convinced we owe in a great measure our immunity from disease at that station.

6.—Should the proposal meet with your approbation, I would be most happy to start the system, and should consult with the Magistrate on details, &c.

7.—The measure might then be carried on in turns by the junior Medical Officers of the European branch of the service, and the men, it is to be hoped, would derive a great benefit from it.

I am, &c.,

(Signed) J. T. C. ROSS, F. R. C. S.

Surgeon H. M's. 21st Hussars.



Classified statement of admissions of Cholera cases in the _____ Regiment, when stationed _____ at _____ during _____, showing the special duties or occupation of each class.

Total strength of each class.	Rank, description, and special duty performed by each class.	No. of cases of cholera.	No. of deaths from cholera.	From what barrack or hospital admitted.	No. of company.	Date of attack.	Remarks on any point connected either with occupation, previous habit, duty, or sickness, &c., &c.
	Commissioned Officers, Officers' Wives, Officers' Children,						<i>In this column it should be stated whether any Officer previous to his attack had suffered from fatigue and exposure from travelling, within a period of 3 months prior to being seized; whether the Regt., or any portion, had recently marched from another station?</i>
	Warrant & Non-Commissioned Officers. Warrant Officers, Serjeant Major, Assistant do., Provost Serjeant, Qr. Master do., Musketry Inspector do. Do Assistant do., Pay Serjeant, Armourer do., Canteen do., Mess do., Schoolmaster do., Saddler do., Farrier do., Hospital do., Corporal for superintending the mens' messes, Drum Major, Pipe Major, Other Serjeants, Corporals,						<i>Which class of Non-commissioned Officers and Privates are totally exempt from parades, and day or night military duty, with any other point affording information connected either with the seizure or death, or antecedent causes; as also what classes sleep out of the mens' barracks, or in separate rooms or quarters, either in the verandahs or elsewhere in the lines.</i>
	Privates. Hospital Orderlies, Assistants to Provost Serjeant, Do. to Canteen Serjeant, Do. to Mess Corporal, Mess Waiters, Batt-Men, Orderly room Clerks, Bandsmen, Pipers, Privates or fighting men not employed on any special duty (married,) Do. do. do. (single,)						<i>The information should be furnished on a supplementary sheet, if the space is too limited to allow of its being written under the proper heading. Initial letters or marks should, in that case, appear opposite the particular class, to correspond exactly with similar indiccs on the supplementary sheet.</i>
	Families. Wives of Non-Commissioned Officers, Children of do., Soldiers' wives, Do. Children,						
	Cook-boys, Hospital Servants, Sweepers, Camp followers, not including any of the above,						

Note.—If any class, rank, or description of duty has been omitted in this form, &c., &c., the omission should be supplied in column 2, the object being to show the exact constitution of the Regiment according to the ordinary duties of every man when in cantonments, and especially such as are exempt from parades, or from sentry duty either by day or night.

MEMO.

FOR THE MEDICAL OFFICER IN CHARGE.

Of _____ Regiment.

1.—Has any Epidemic, or disease more prevalent than usual, attacked the Regiment under your charge during the last six years ?

2.—Has any such unusual disease prevailed in the Barracks at present occupied by the corps ? [*Supposing that the Regiment has only recently arrived at the station, or that any of the barracks or lines are at present empty, this information will be gained from the Brigade office or Station Staff.*]

3.—If so, is there any cause to which you attribute the disease either wholly or in part, or any circumstance tending to aggravate or prolong it ?

4.—Was any barrack, or portion of a barrack, exempt either wholly or nearly so, and what circumstances present a difference between that and the other barracks ?

5.—Were any class of men under your charge more exempt from, or more subject to the disease than others, and can you suggest any reason for the difference ?

6.—Where cholera has attacked other troops in the station, have the soldiers under your care escaped ?

7.—What proportion of the men according to their special duties, suffered most, or were comparatively exempt from the attack ? [*This information should be furnished in the form given on the reverse, F.*]

8.—Previous to the out-break of cholera, was diarrhœa or dysentery prevalent amongst the men ?

9.—Had the health of the Regt. been previously above or below the average of past years ?

10.—Was the drinking-water boiled or filtered previous to the appearance of cholera, and is it so at the present time ?

11.—Is there any evidence to show that those using water from one particular well or tank suffered more or less than others who obtained their drinking water from a different source ?

12.—What is the depth of the surface of the water from the surface of the ground above, and what is the depth of water ?

13.—Is the effluvium from the urinaries or latrines complained of at any time by the men when in their barracks ?

14.—Is there any regimental supervision constantly kept up over the sweepers, to secure the efficient cleansing of these places ?

15.—The same also with regard to the cooking, tinning of the kitchen utensils, &c. ?

16.—Do the men sleep out of doors, or on the ground in the verandahs, during any portion of the hot weather ?

17.—Have the rations been condemned in any great degree previous to the appearance

of cholera, or at other times ?

18.—Did the cattle (sheep and cows) suffer from any disease or murrain during the year 1860 or 1861 ?

19.—Are the cattle inspected by any competent person previous to their being killed ?

20.—How many times are beef and mutton rations supplied weekly ?

21.—Do. do. vegetables, and in what quantity regularly through the year ?

22.—Do the men purchase additional rations, and have they a mess-man to superintend the ordering and preparation of every meal ?

23.—Would it be desirable to let the bread be baked in the Regiment, if proper ovens and kneading apparatus were supplied from England ?

24.—What amount of cubic feet of air, and how much superficial space, has been the average allowed to every man both in barracks and hospital ?

25.—Is the ventilation, in your opinion, amply sufficient during the hot weather ?

26.—Do the men regularly bathe or wash their bodies, or in what proportion only as regards numbers ?

27.—Mention any circumstances which you think may have tended to cause disease or sickness either directly or indirectly.

28.—Are there any suggestions you would make, or have made in your previous reports, as regards improved sanitation, or any measures for preventing disease amongst troops ?

29.—To what causes do you principally attribute the superior healthiness of the officers, and their comparative immunity from cholera and other diseases, which prove so fatal to soldiers, especially when they appear in an epidemic form ?

C. HATHAWAY,

Special Sanatory Commissioner.

Note.—The replies may be numbered 1. 2. 3, &c., to save the trouble of copying the different questions.

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